FIG. 1

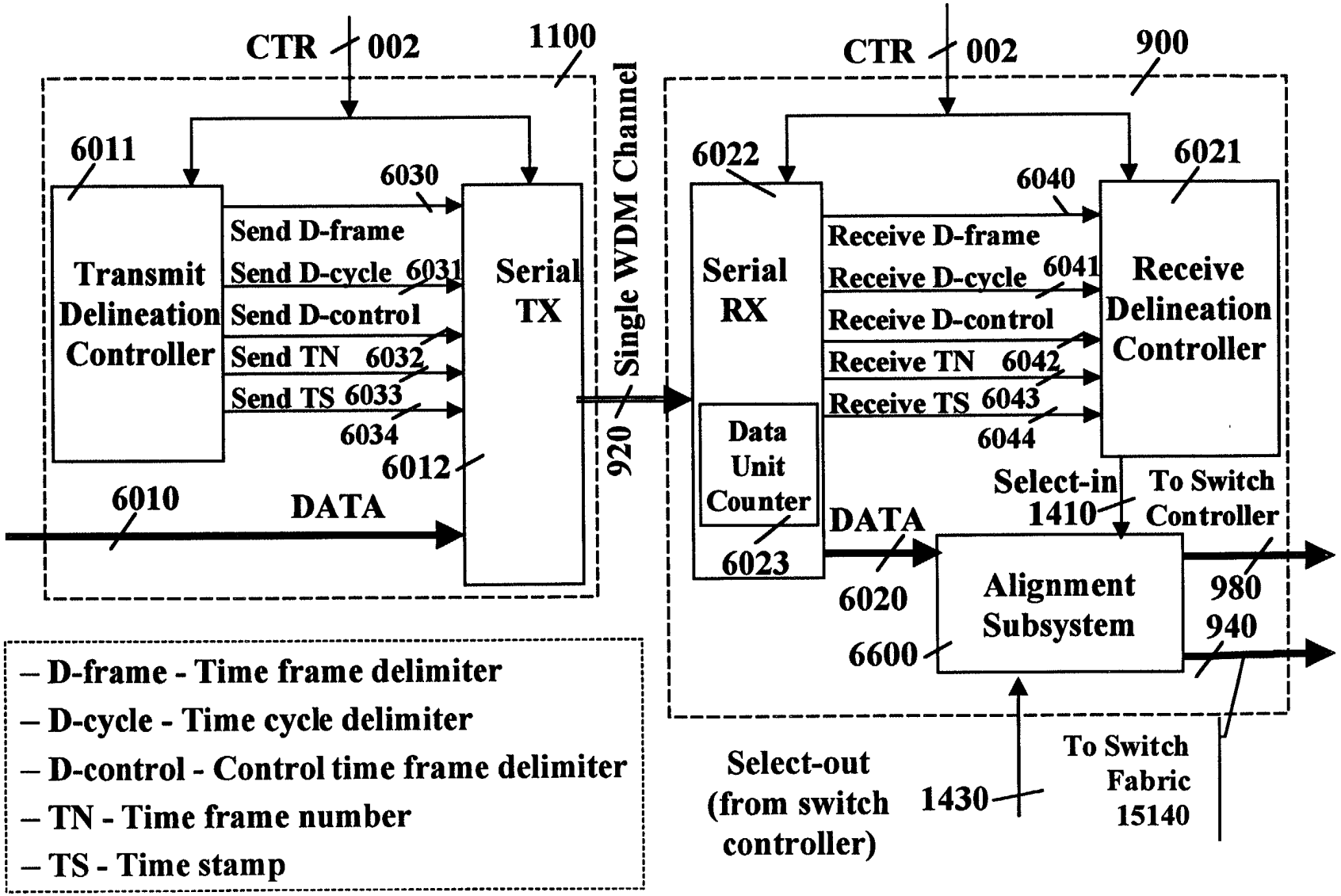


FIG. 2

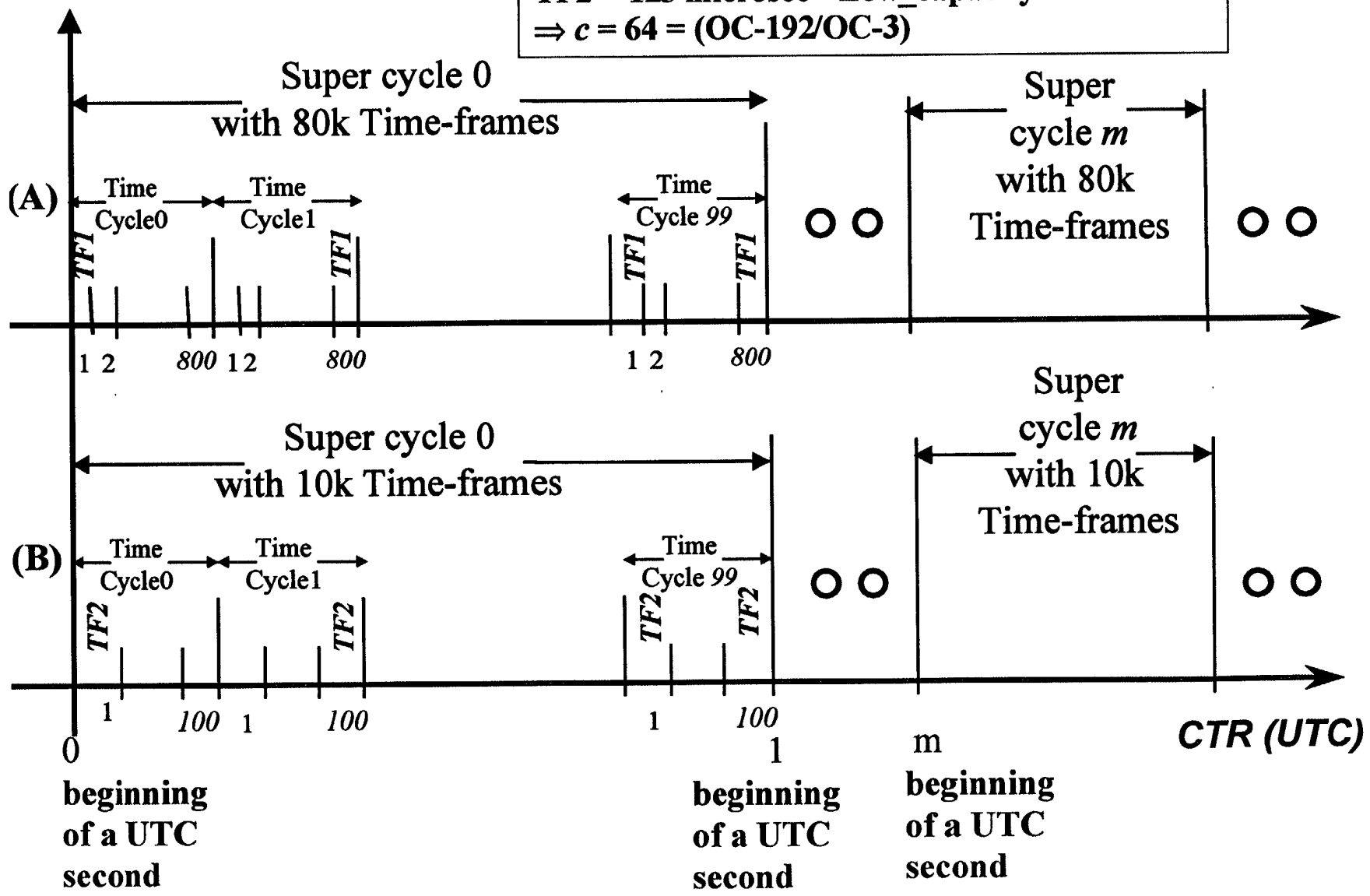


FIG. 3

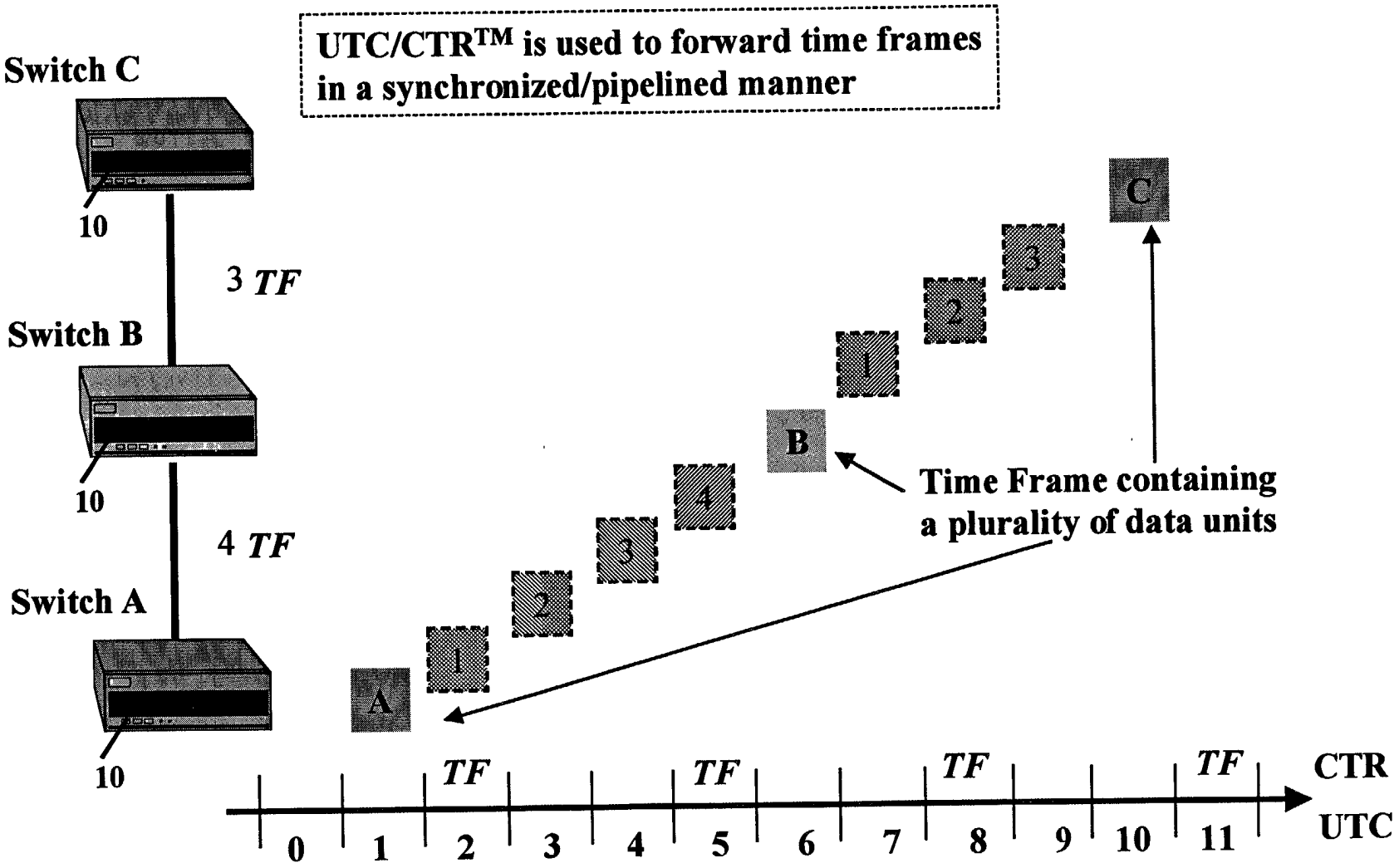
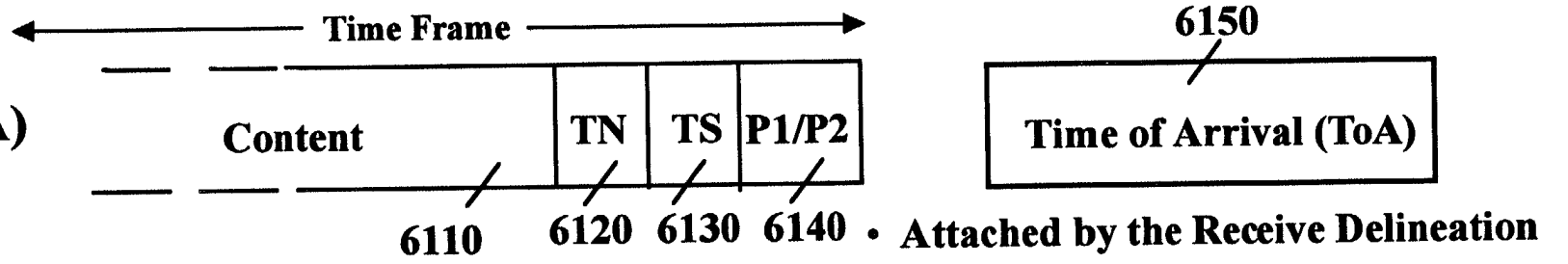

UTC/CTR™ is used to forward time frames in a synchronized/pipelined manner
Switch C
Switch B
Switch A
10
10
10
3 TF
4 TF
A
B
C
1
2
3
4
1
2
3
Time Frame containing a plurality of data units
TF
TF
TF
TF
CTR
UTC
0
1
2
3
4
5
6
7
8
9
10
11

FIG. 4



- Attached by the Receive Delineation Controller
- The TOA represents the instant value of the common time reference 002 when the time frame is received

(B) P1/P2

P1/P2=00 D-frame - Time frame delimiter
P1/P2=01 D-cycle - Time cycle delimiter
P1/P2=10 D-control - Control time frame delimiter

TN - Time frame number
TS - Time stamp

FIG. 5

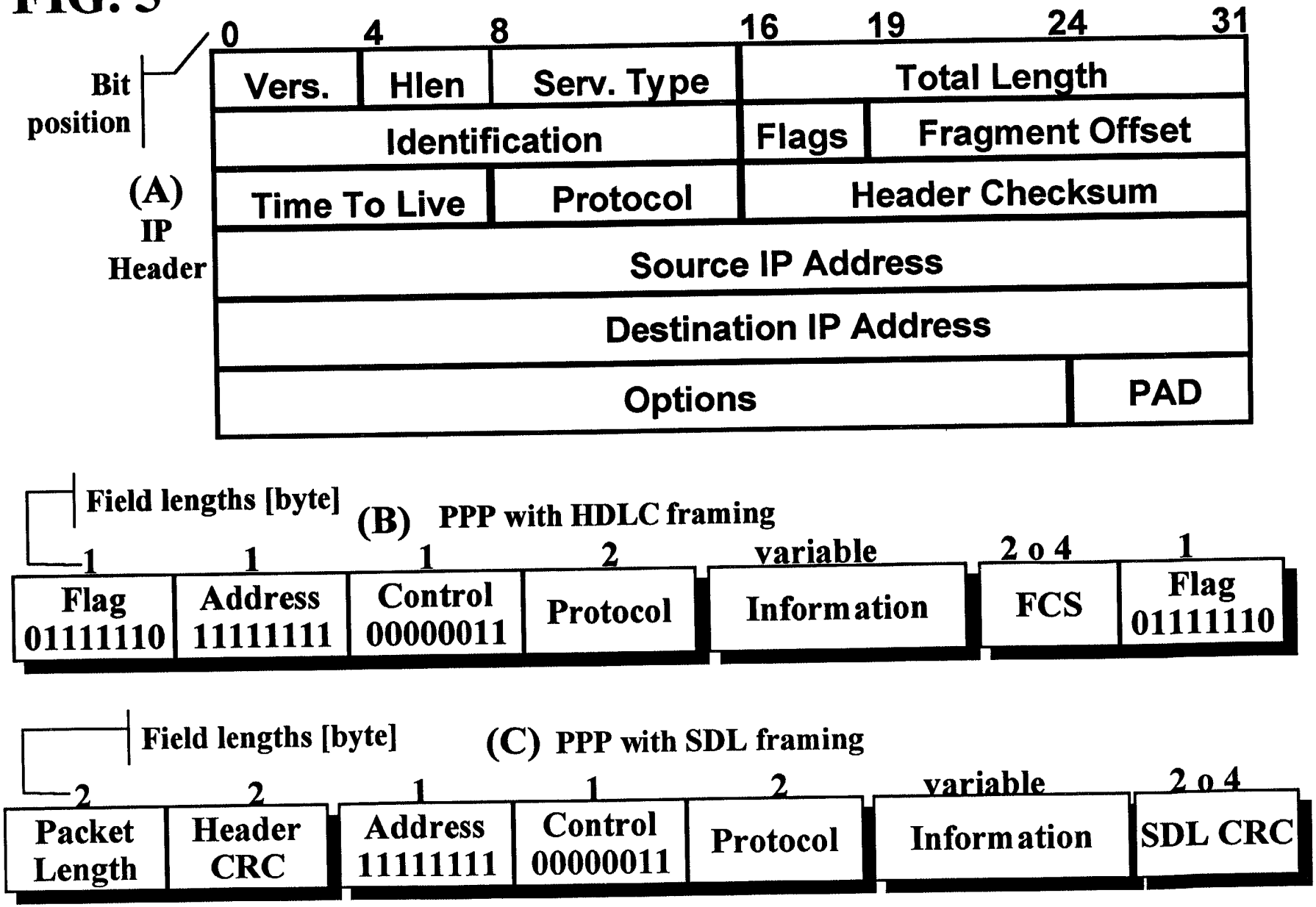


FIG. 6

- SONET - synchronous optical network
- Multiplexing method: byte interleaving
- Signal hierarchy: OC-N (STS-N)
  - STS-N rate: N*51.84 Mb/s
  - Frame format: 9 rows by 90*N columns
    - capacity: N*810 bytes in 125 microsecond.
    - overhead: N*27 bytes
    - payload: N*783 bytes

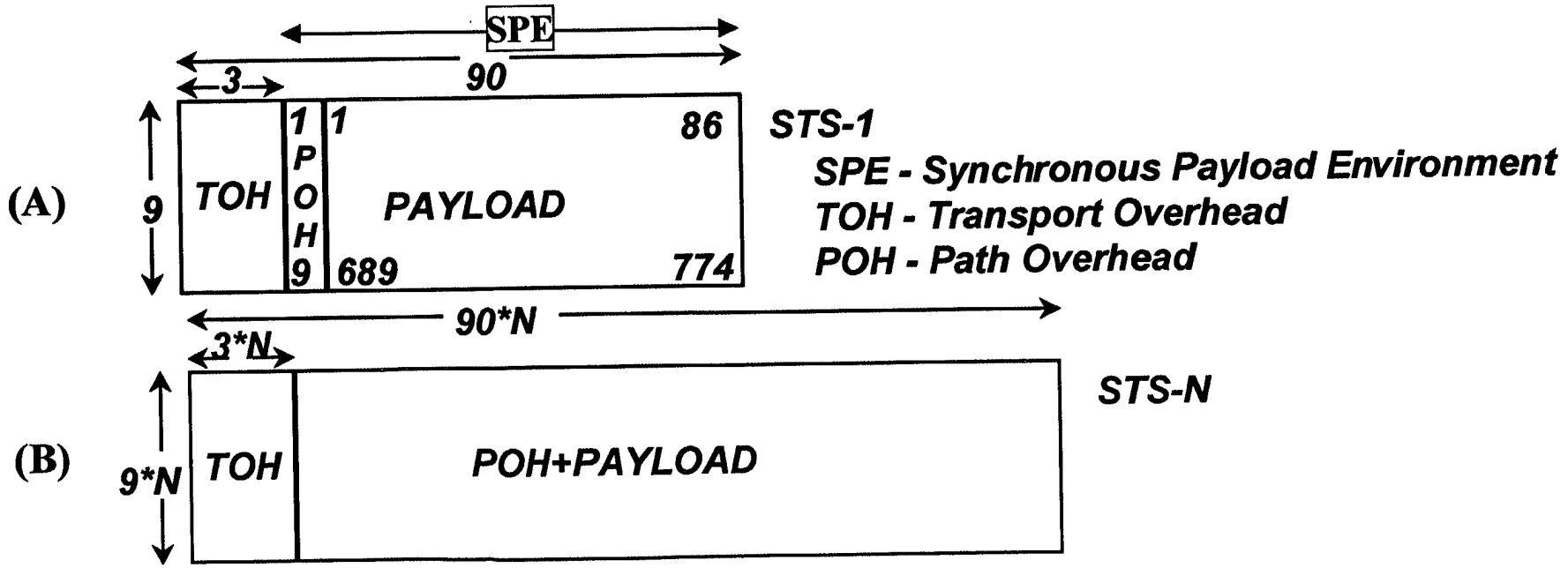


FIG. 7

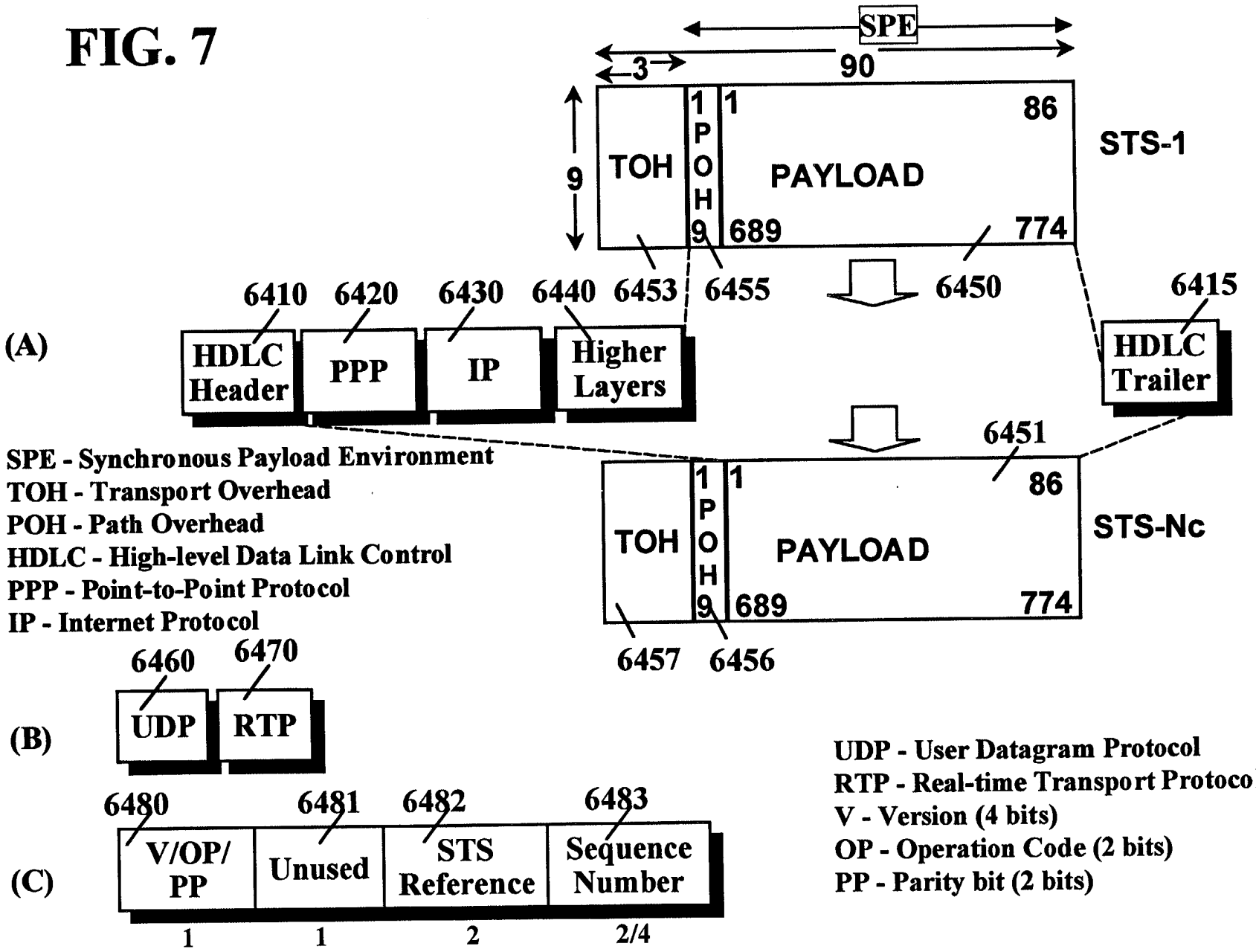
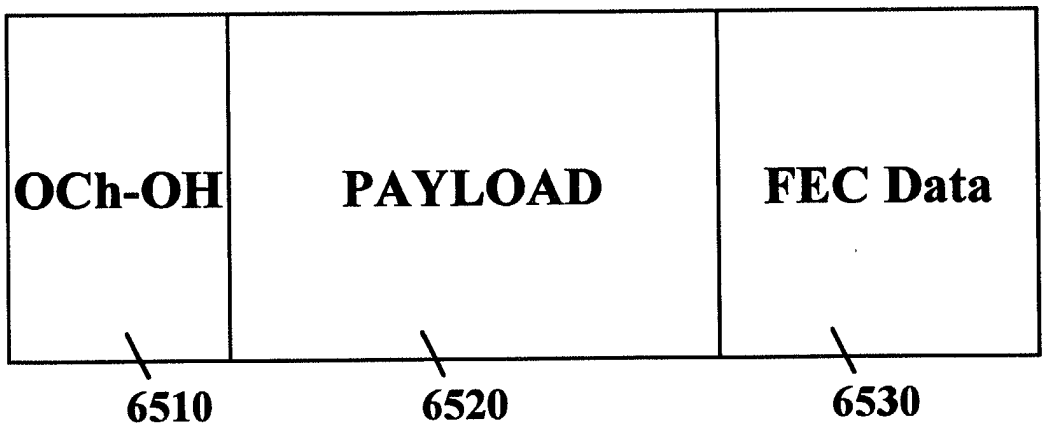


FIG. 8



OCh - Optical Channel
OH - Overhead
FEC - Forward Error Correction

FIG. 9

***TF Alignment of* UTR(j) *to* UTC -** **with three input queues - principle of operation:**
The same queue is not used simultaneously for:
1. Receiving data packets from the serial link, and
2. Forwarding data packets to the switch fabric

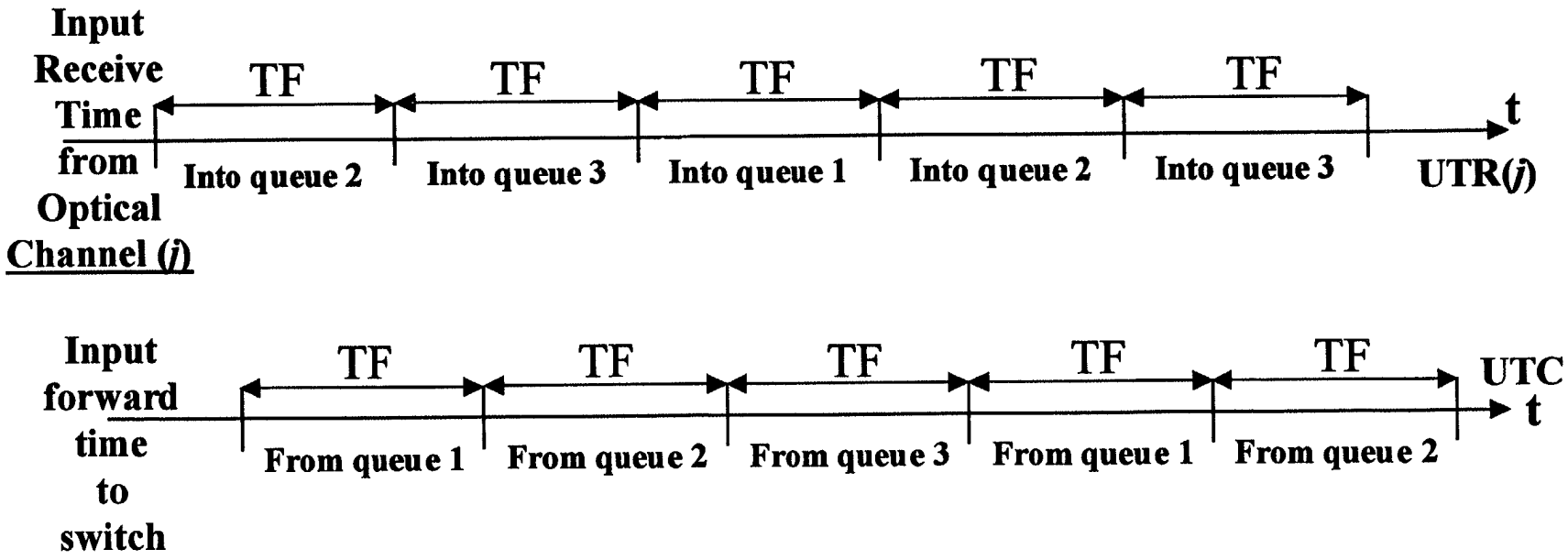
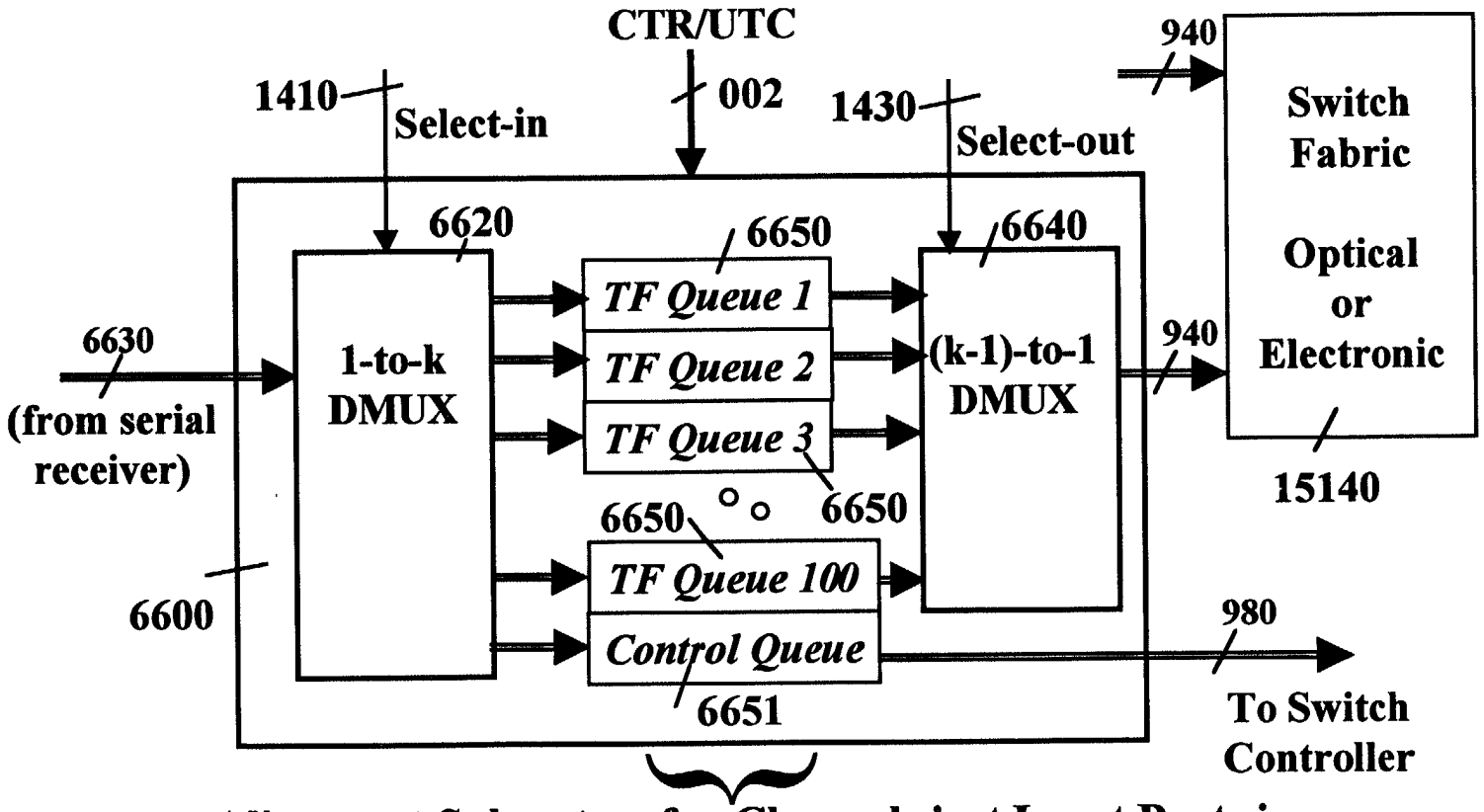


FIG. 10



Alignment Subsystem for Channel *j* at Input Port *i*
with a Plurality of k Time Frame Queues, where k is the number of time frames in one time cycle

FIG. 11

Maximum alignment subsystem requirements for
local recovery from **arbitrary timing failure**:
- *For immediate recovery a time measurement time stamp should be sent every time frame and/or time cycle.*

Time Cycle	OC-48 – 2.4 Gb/s	OC-192 – 9.6 Gb/s
1 ms	0.3 MByte	1.2 MByte
2 ms	0.6 MByte	2.4 MByte
4 ms	1.2 MByte	4.8 MByte
10 ms	3 MByte	12 MByte
20 ms	6MByte	24 MByte

FIG. 12

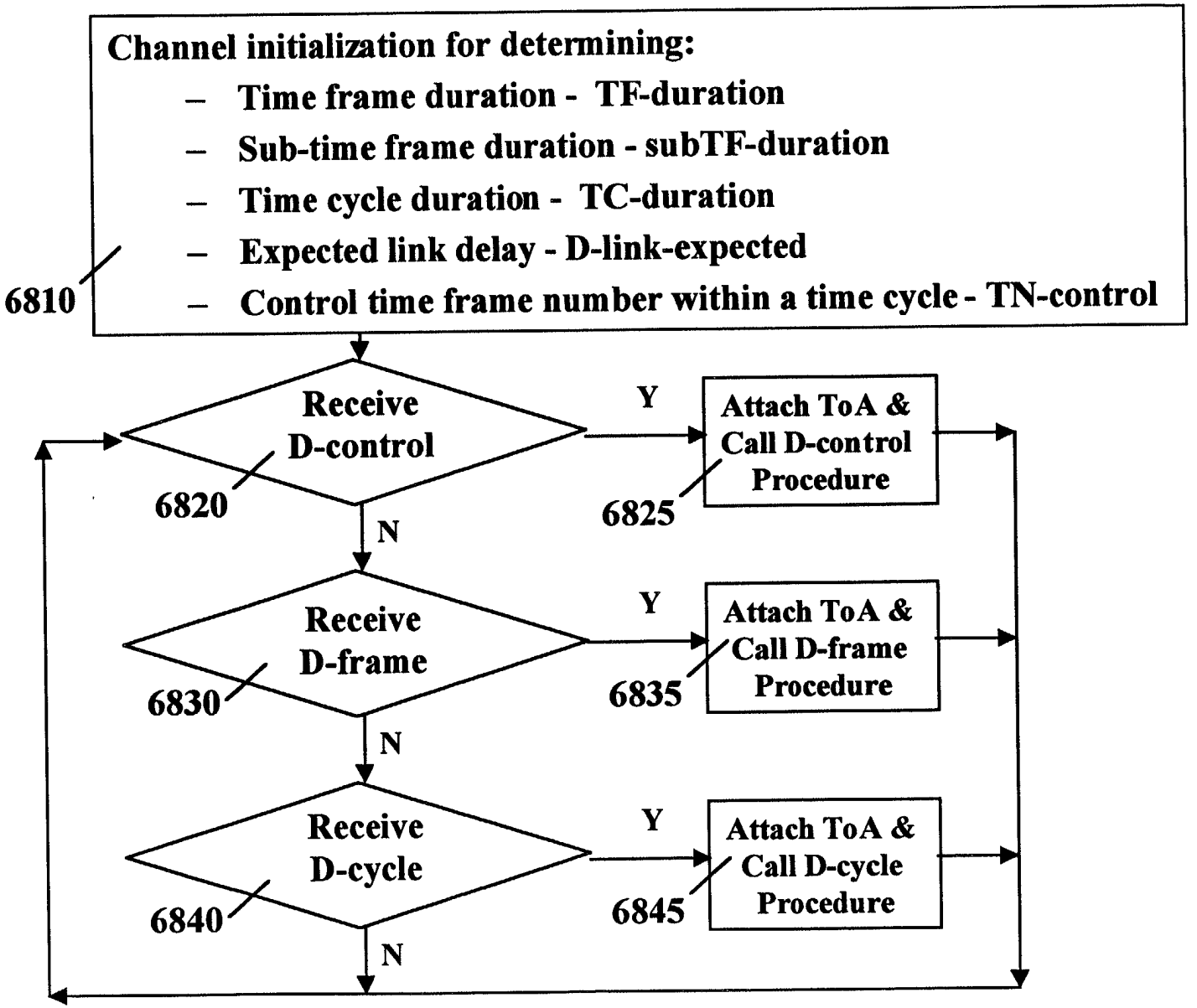


FIG. 13

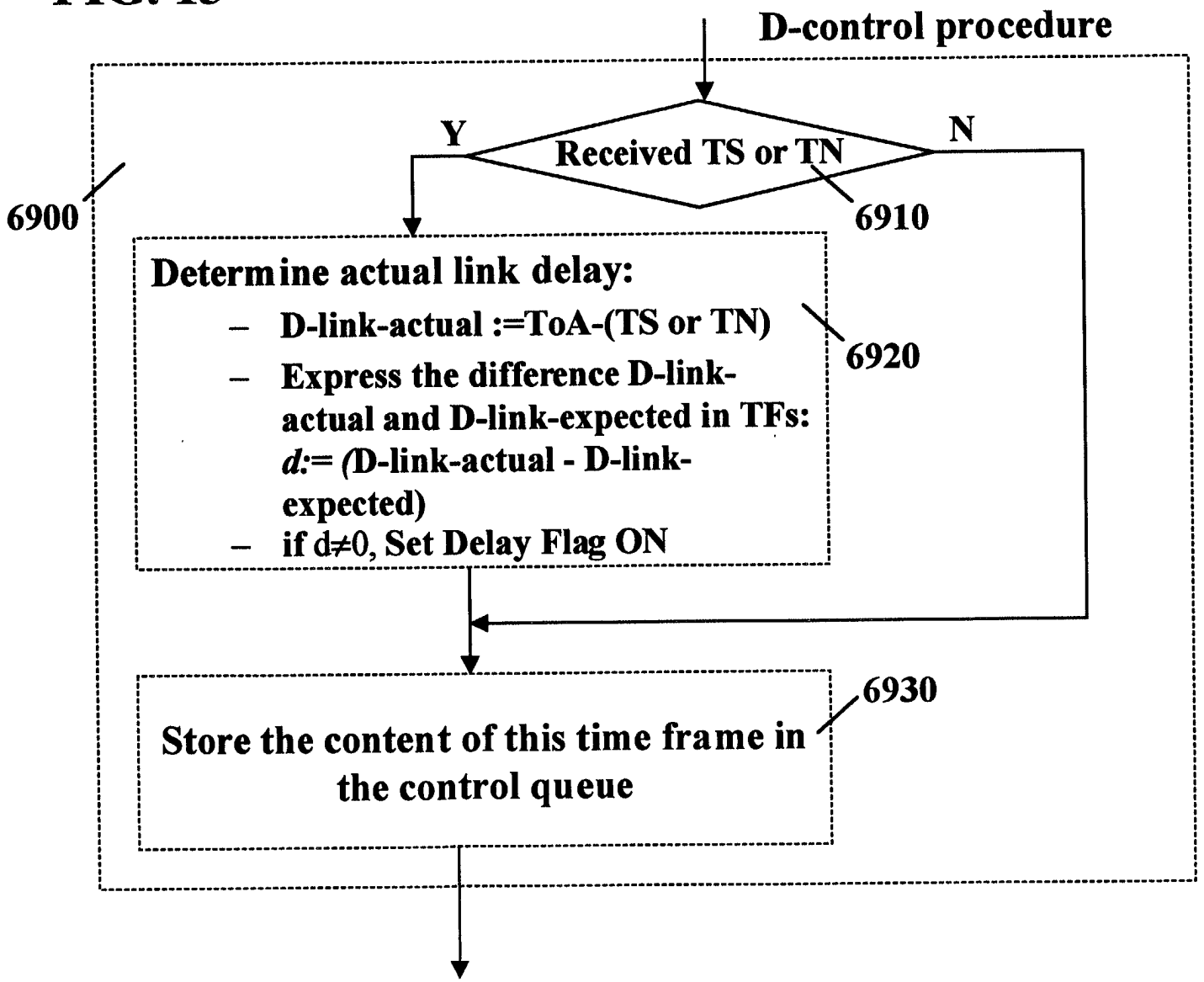


FIG. 14

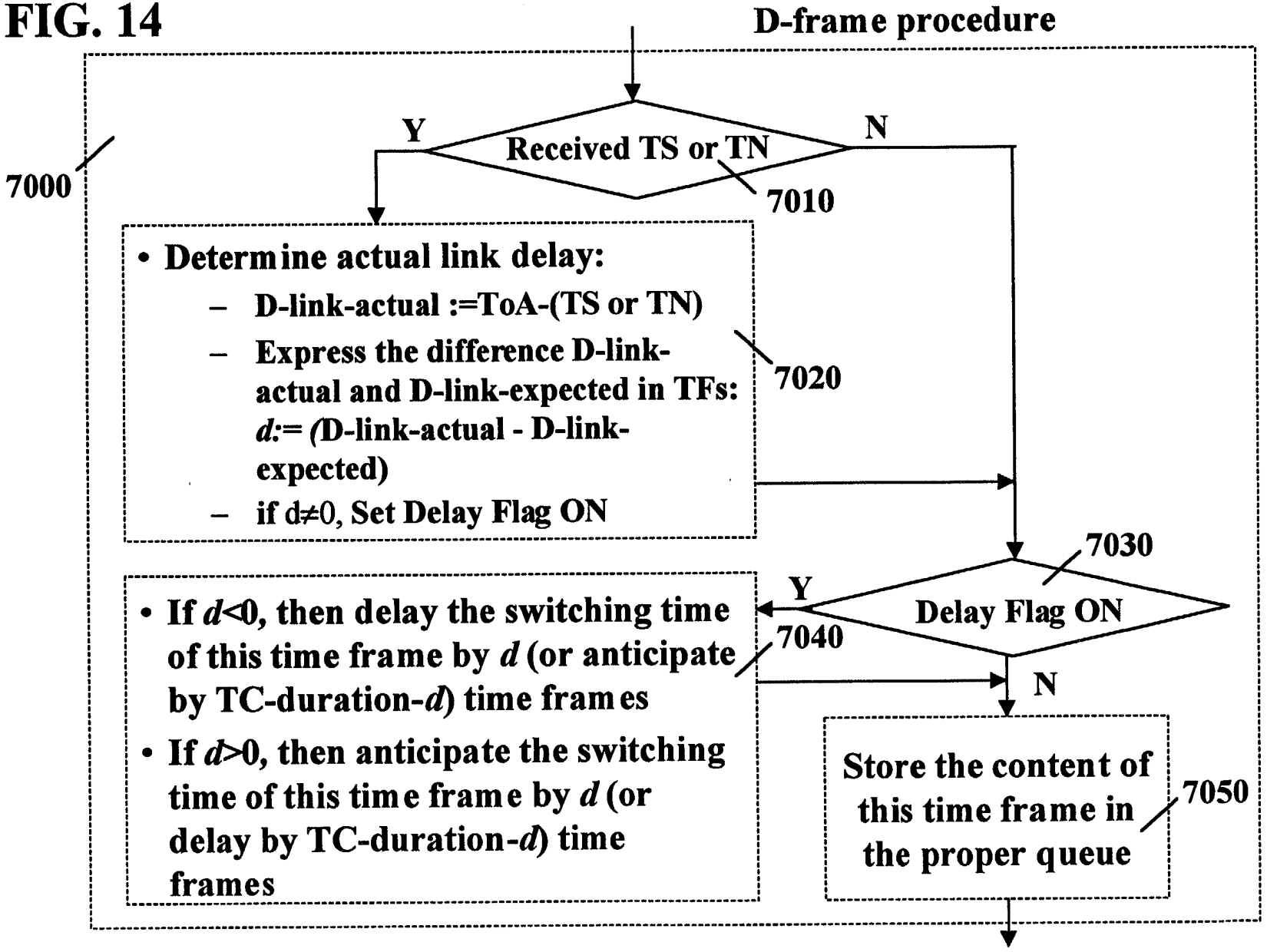


FIG. 15

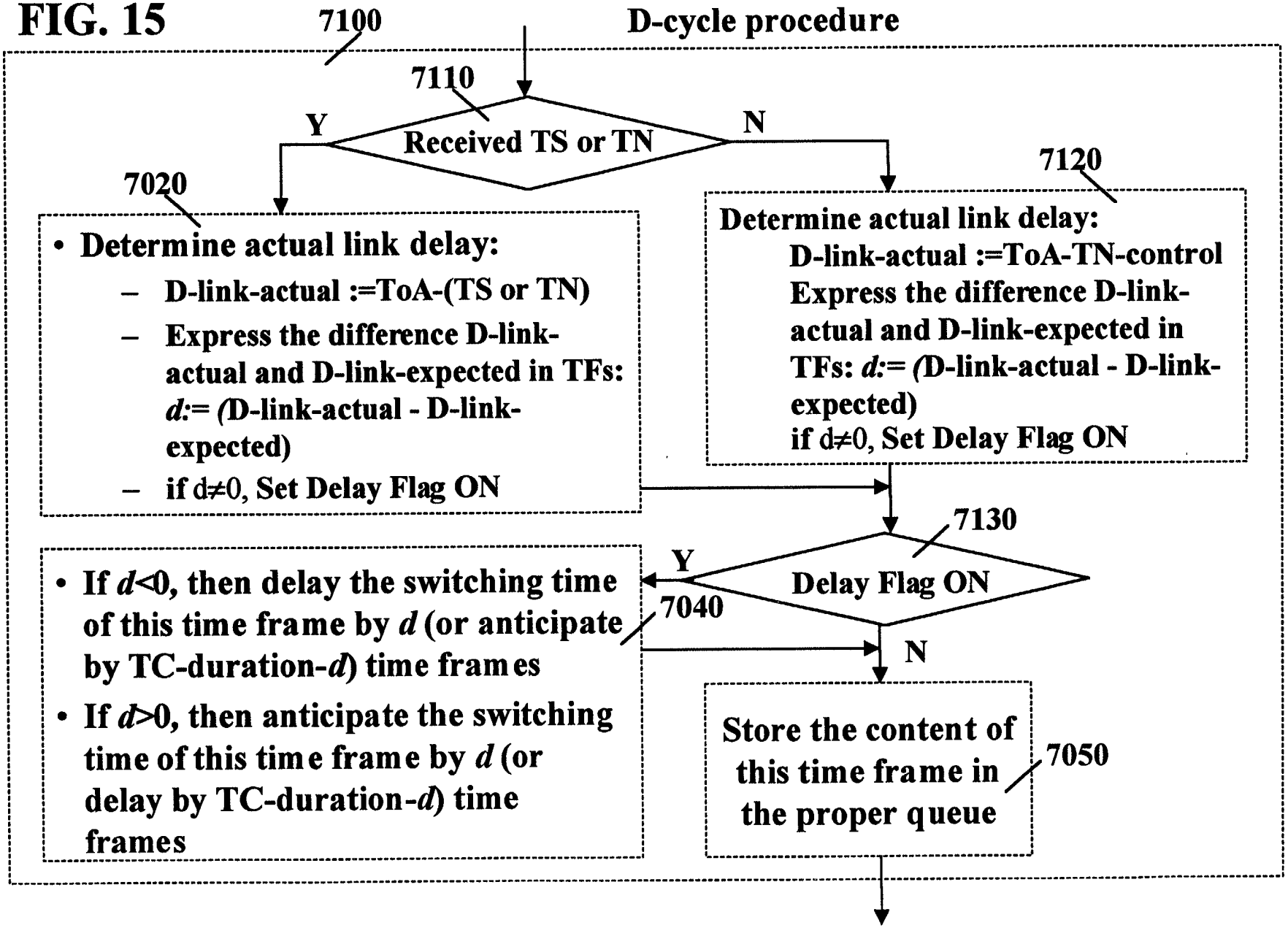


FIG. 16

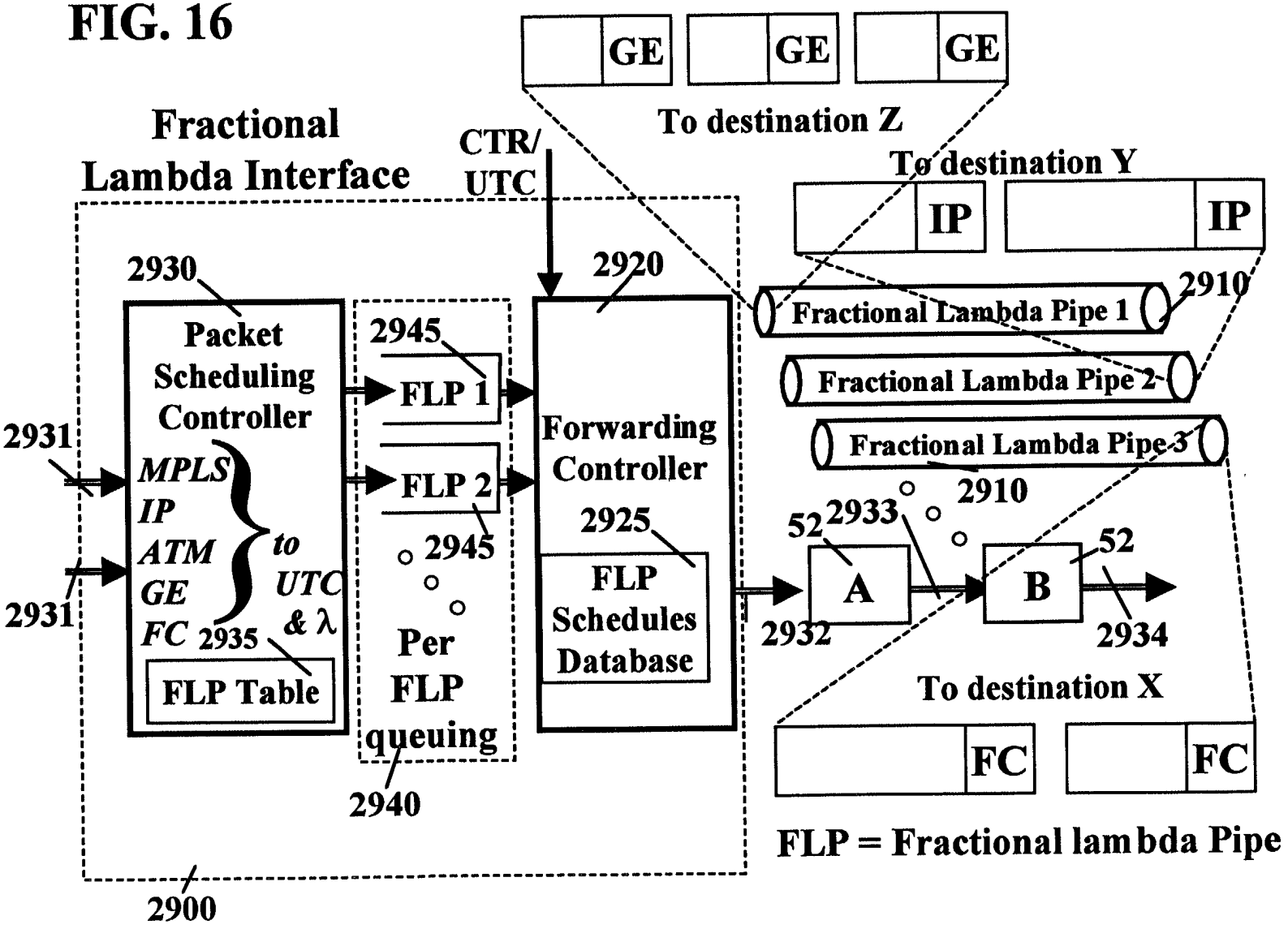


FIG. 17

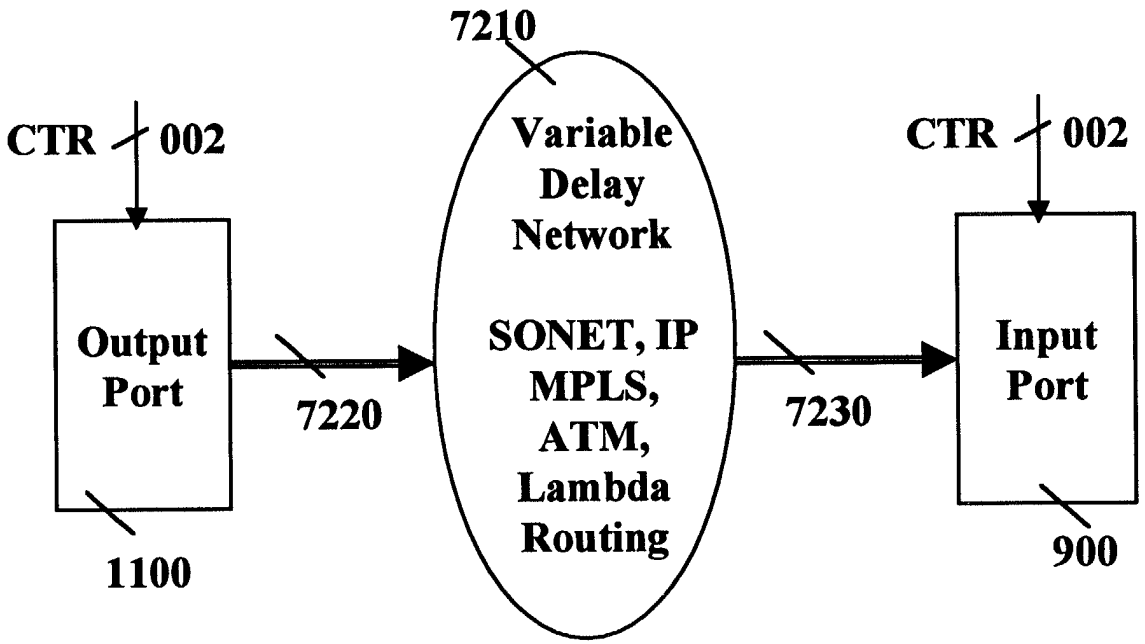


FIG. 18

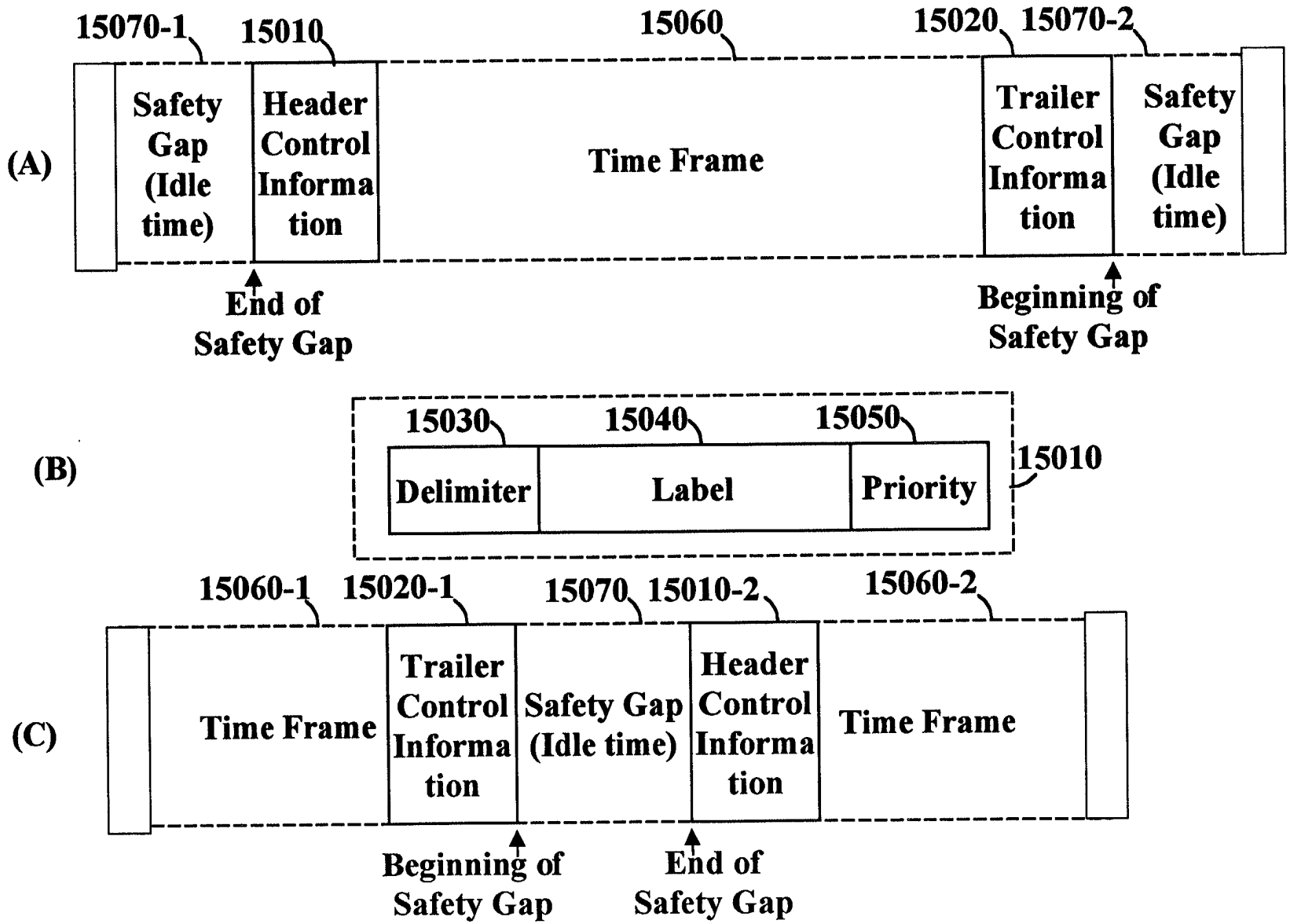


FIG. 19

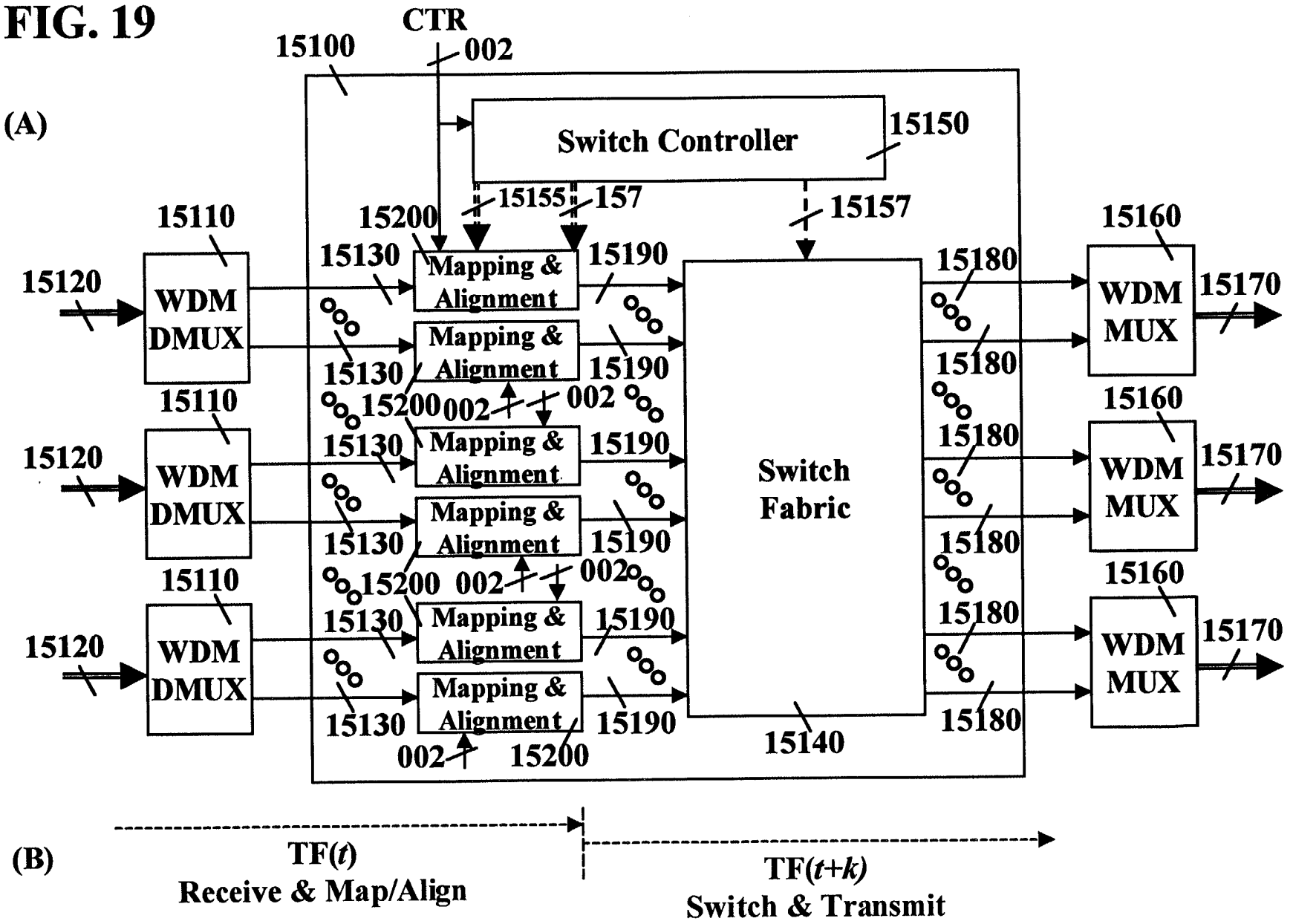


FIG. 20

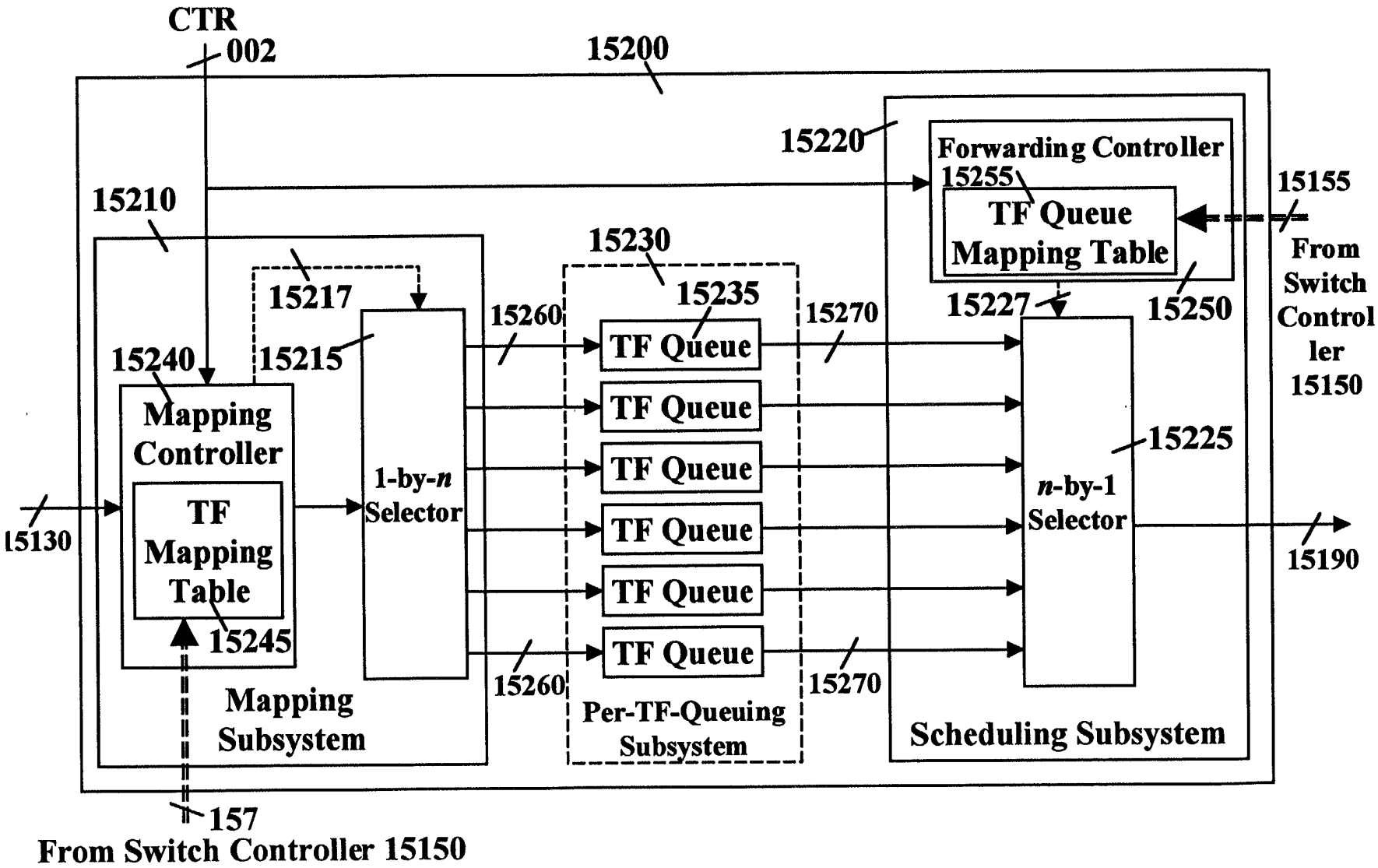


FIG. 21

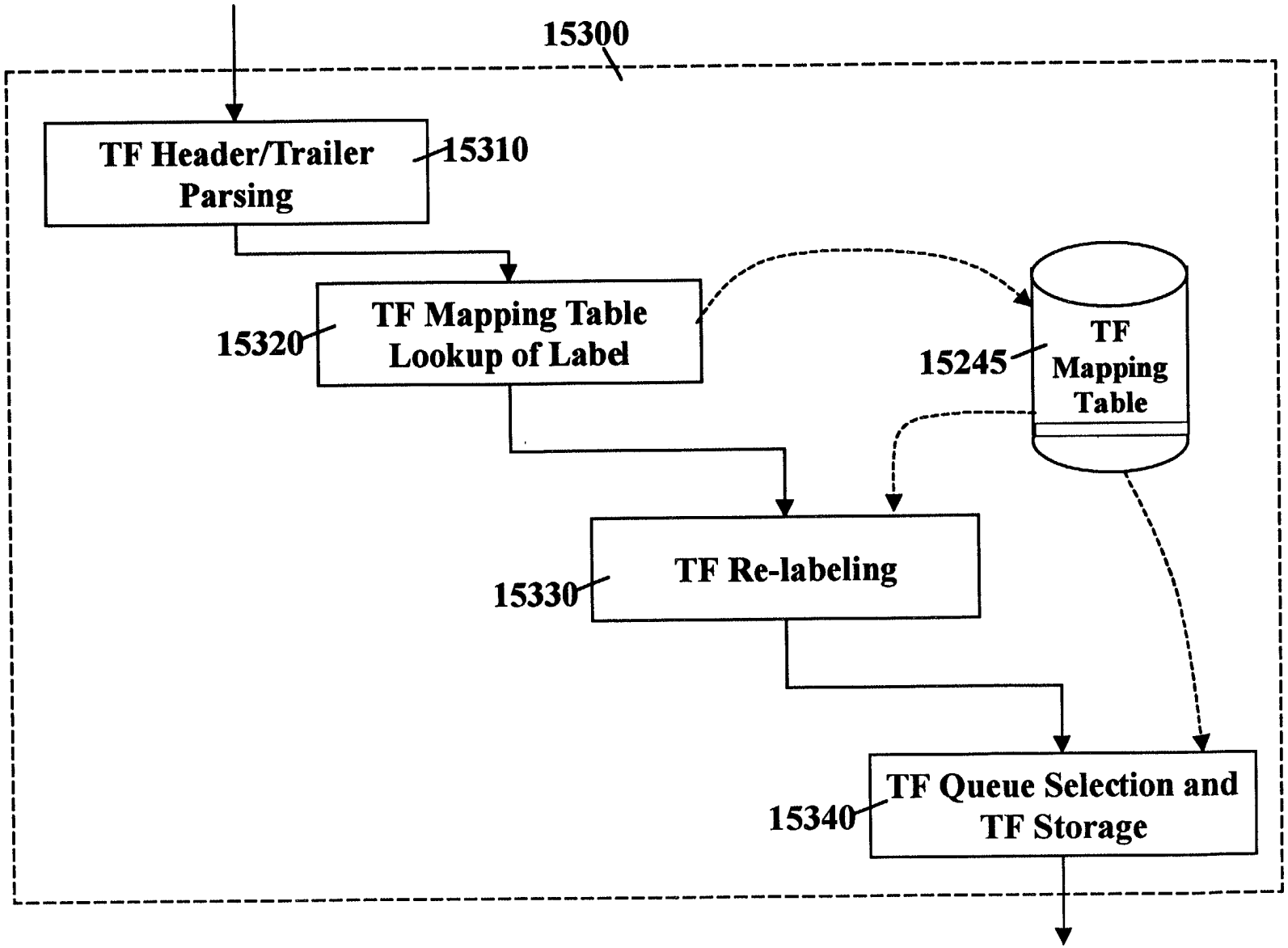


FIG. 22

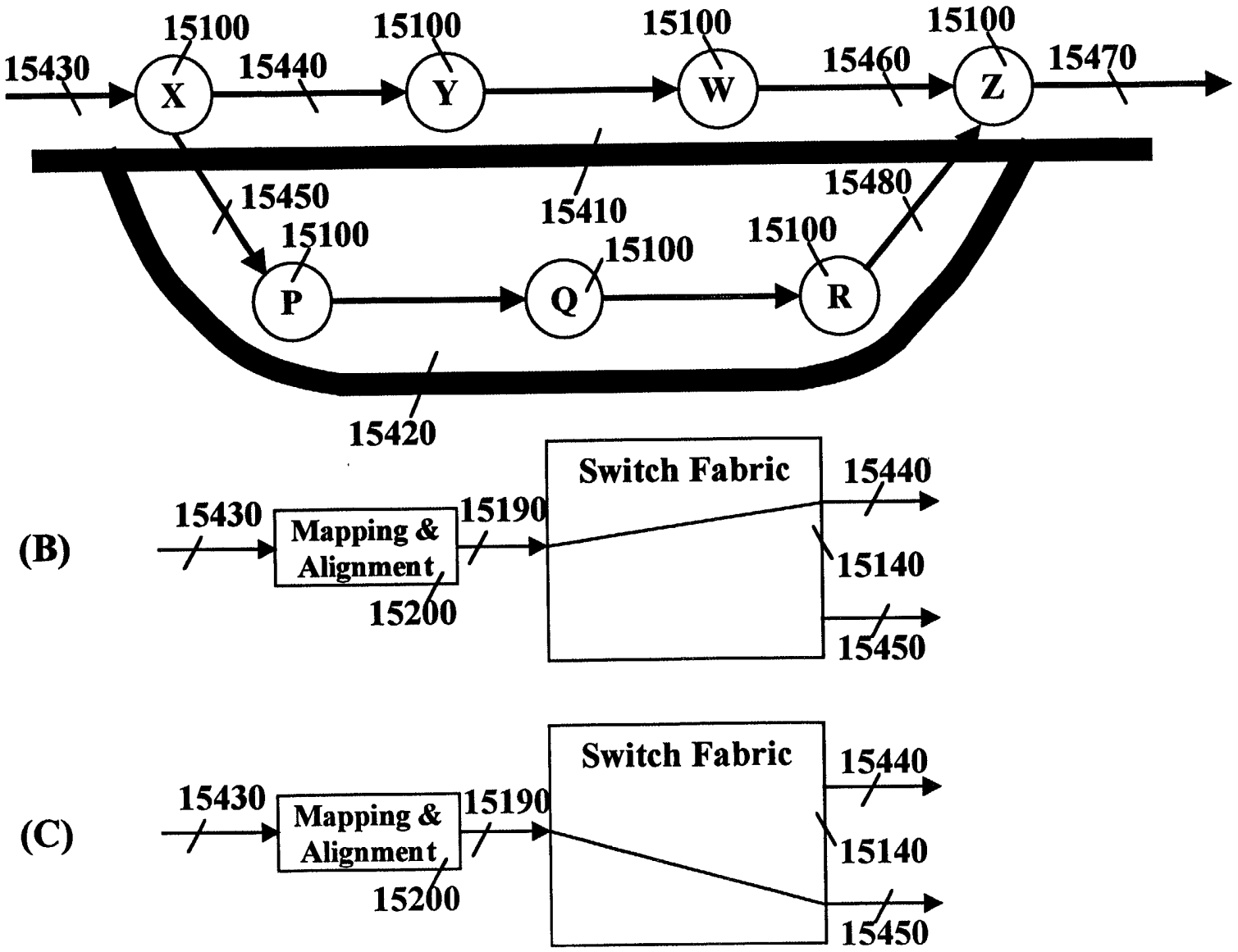


FIG. 23

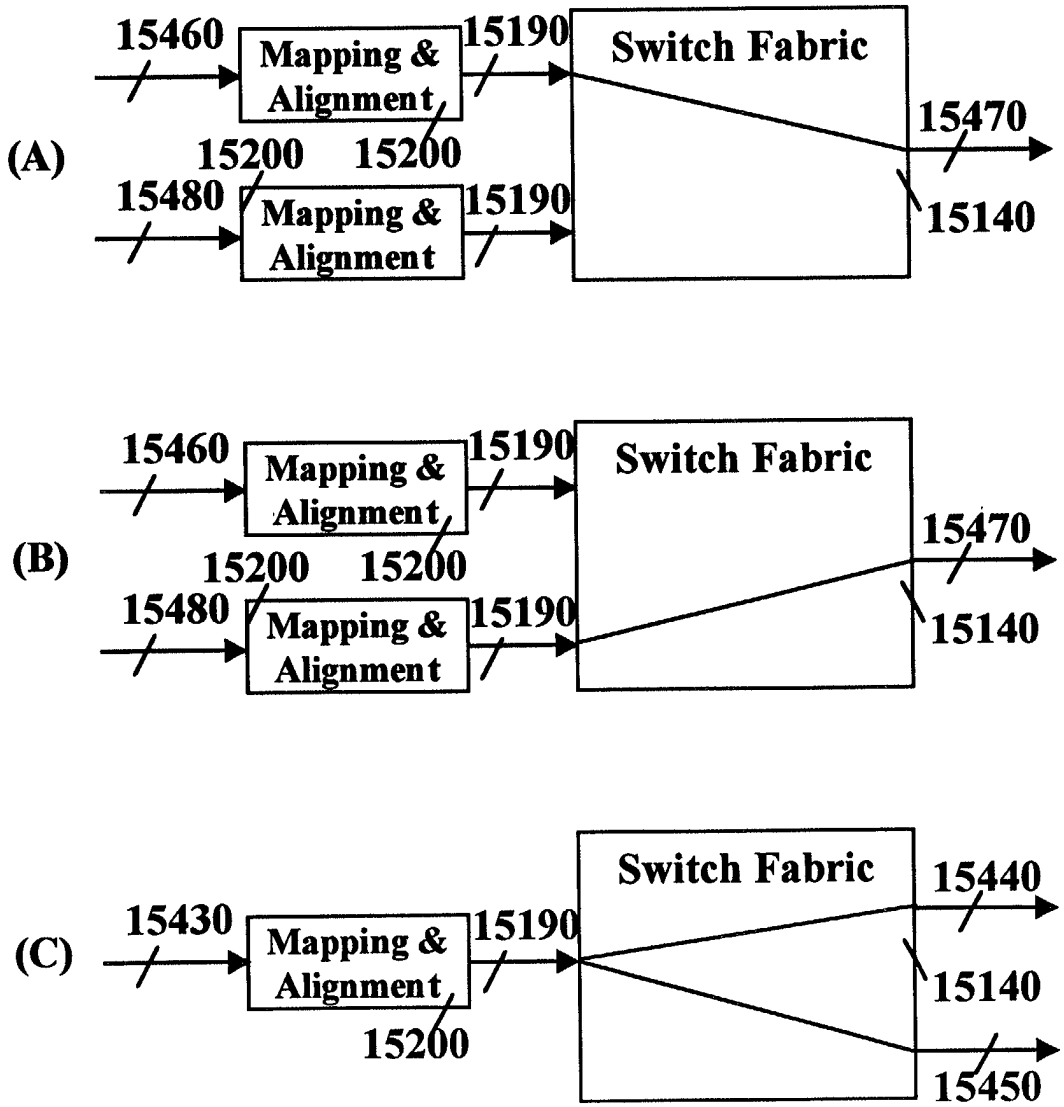


FIG. 24

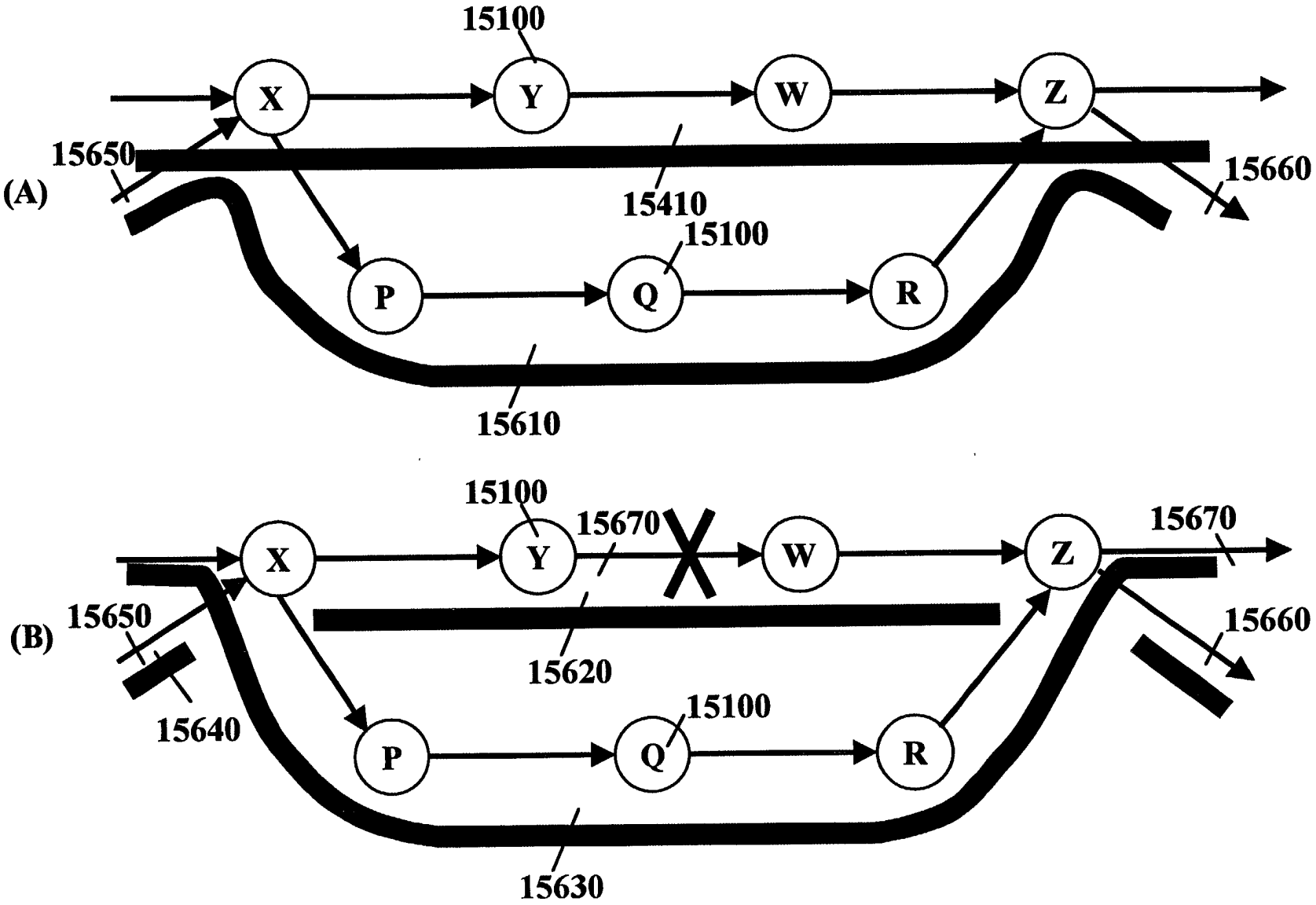


FIG. 25

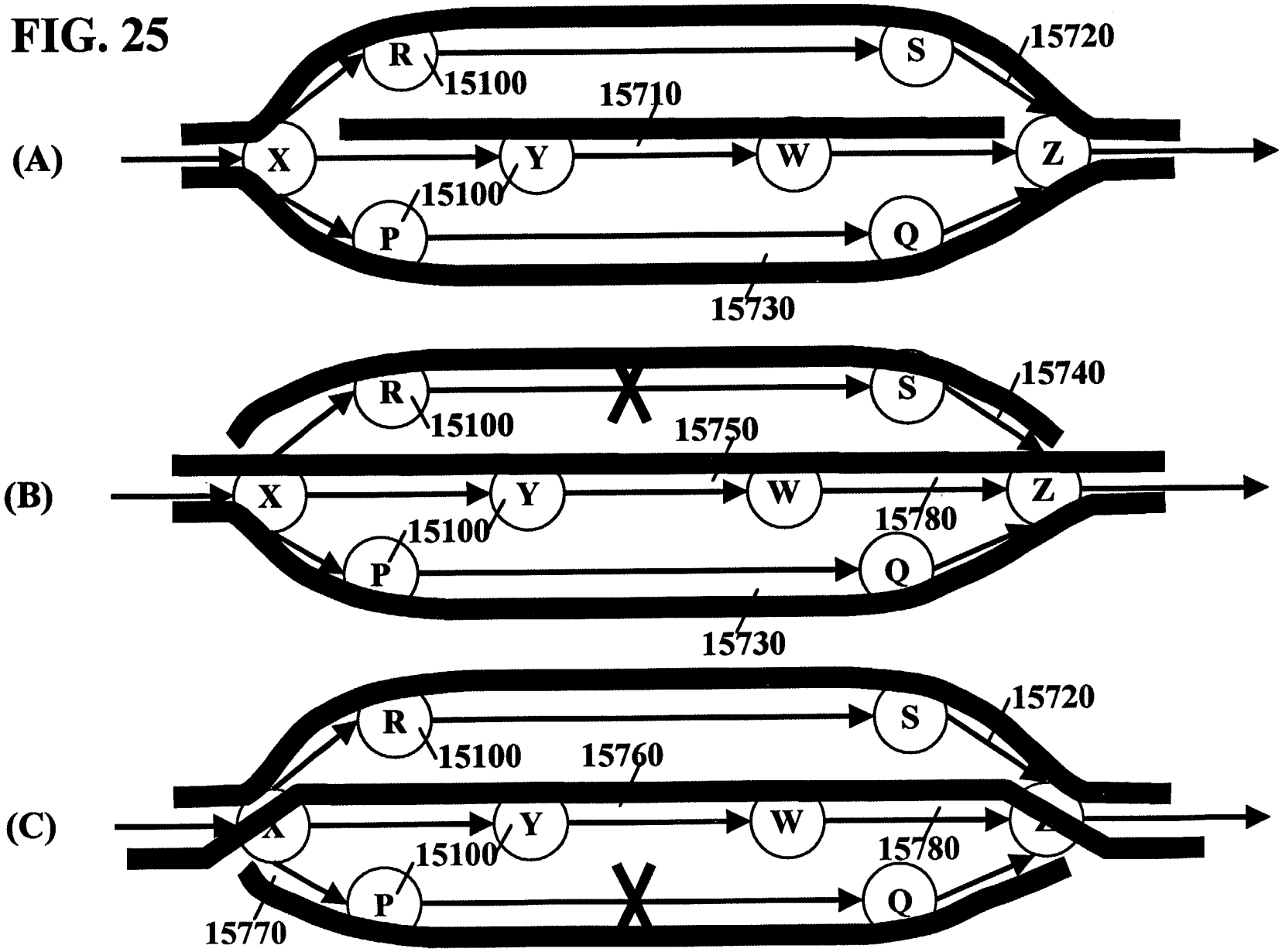
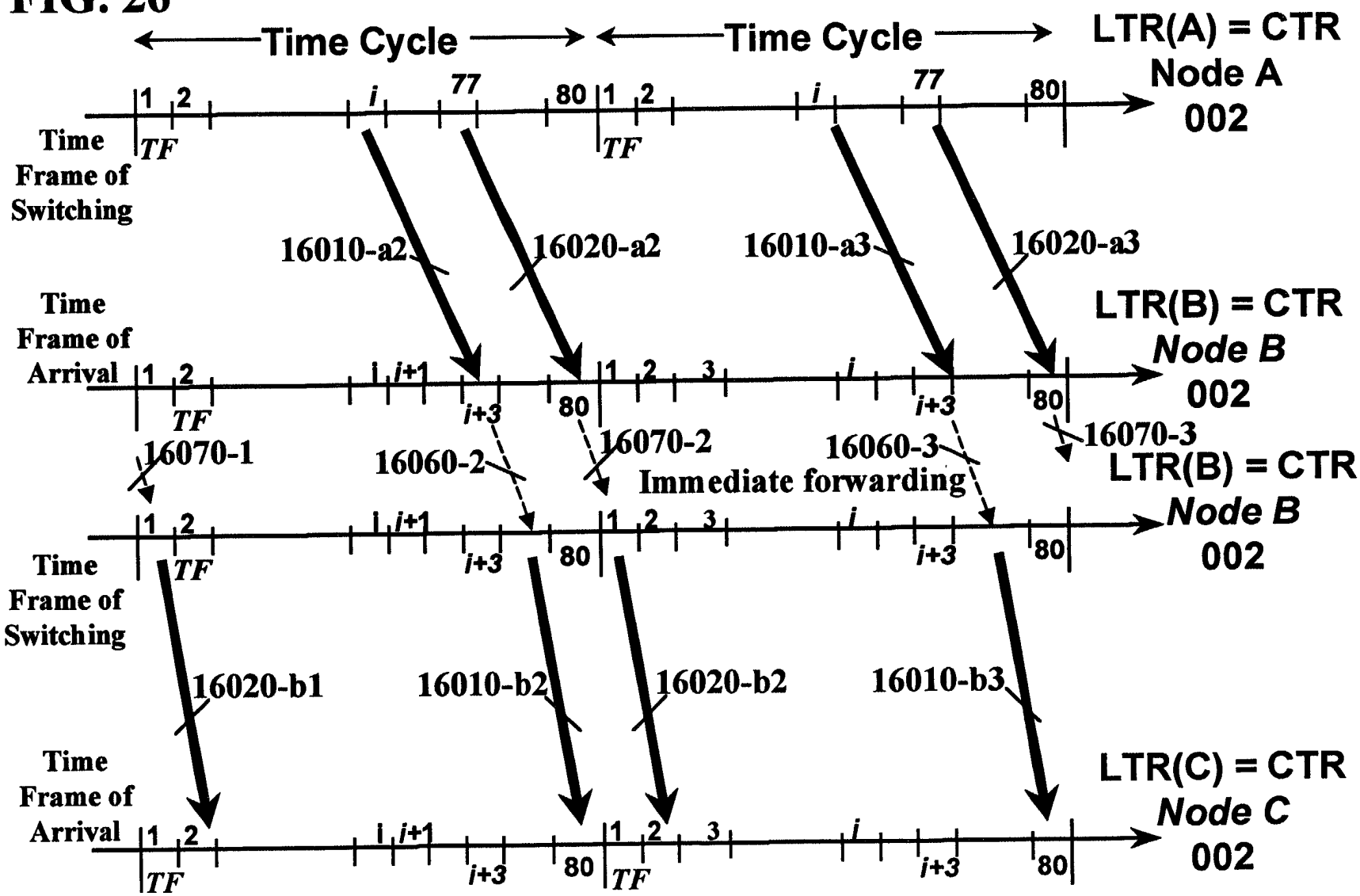


FIG. 26



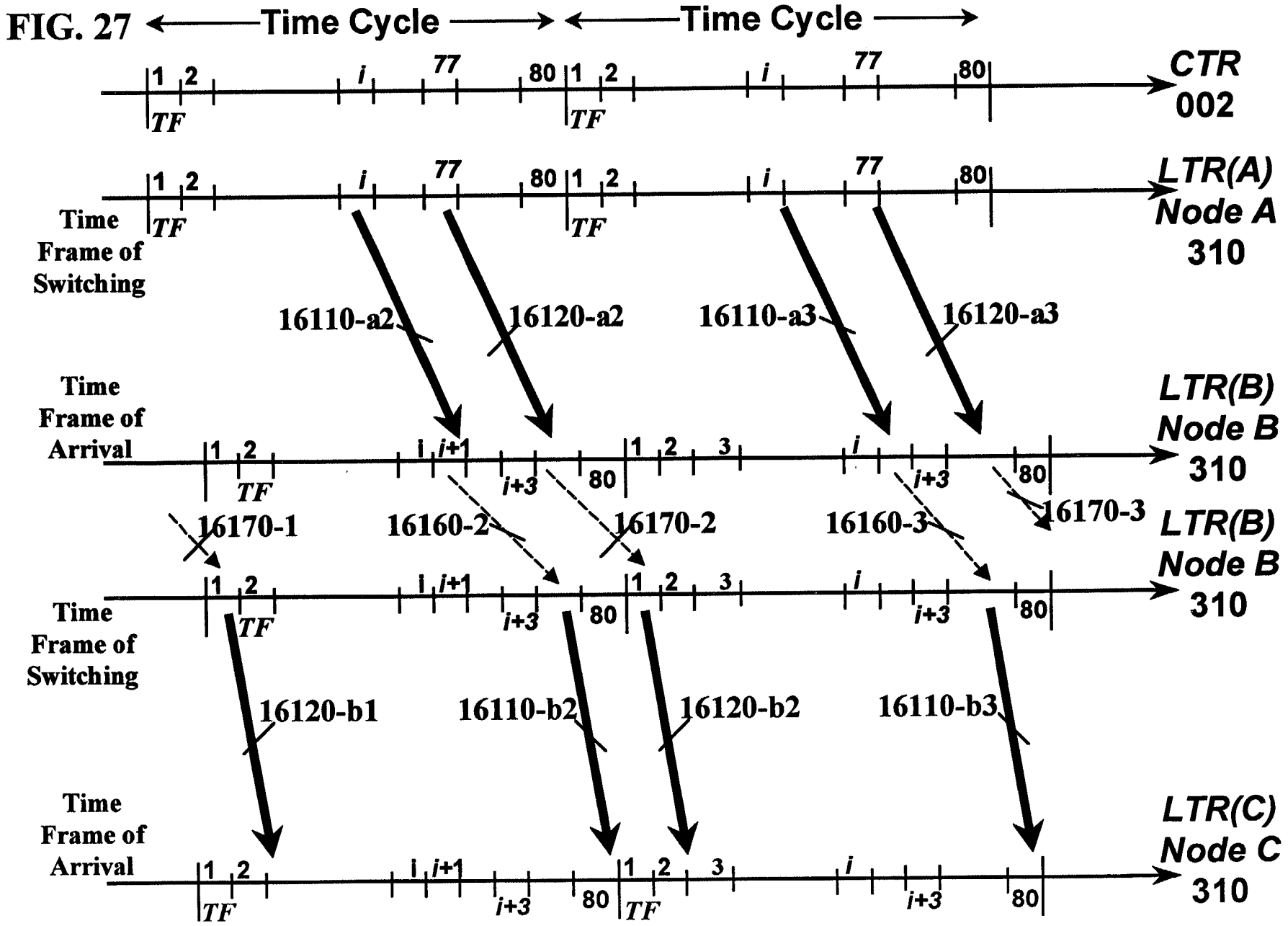


FIG. 28

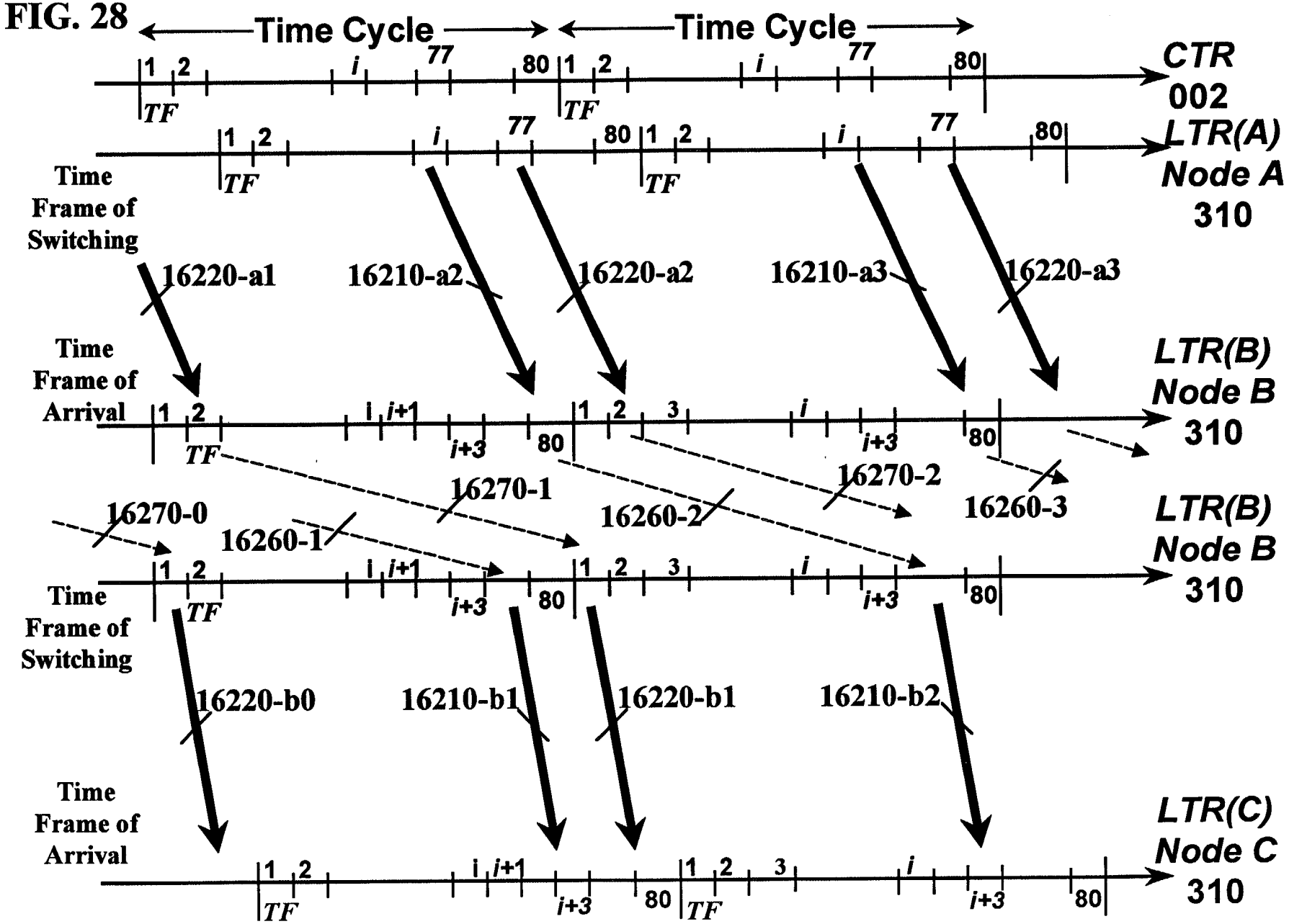


FIG. 29

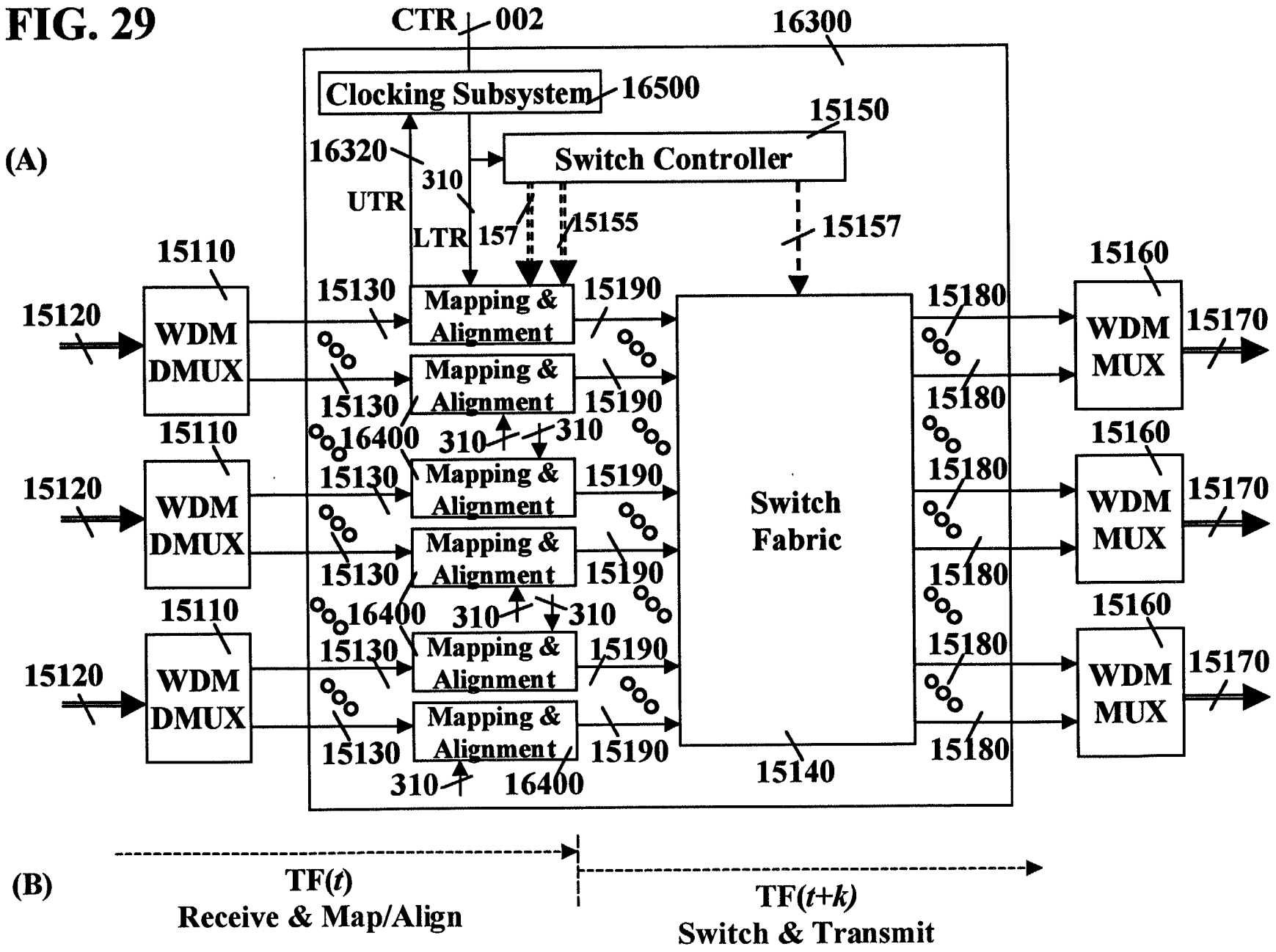


FIG. 30

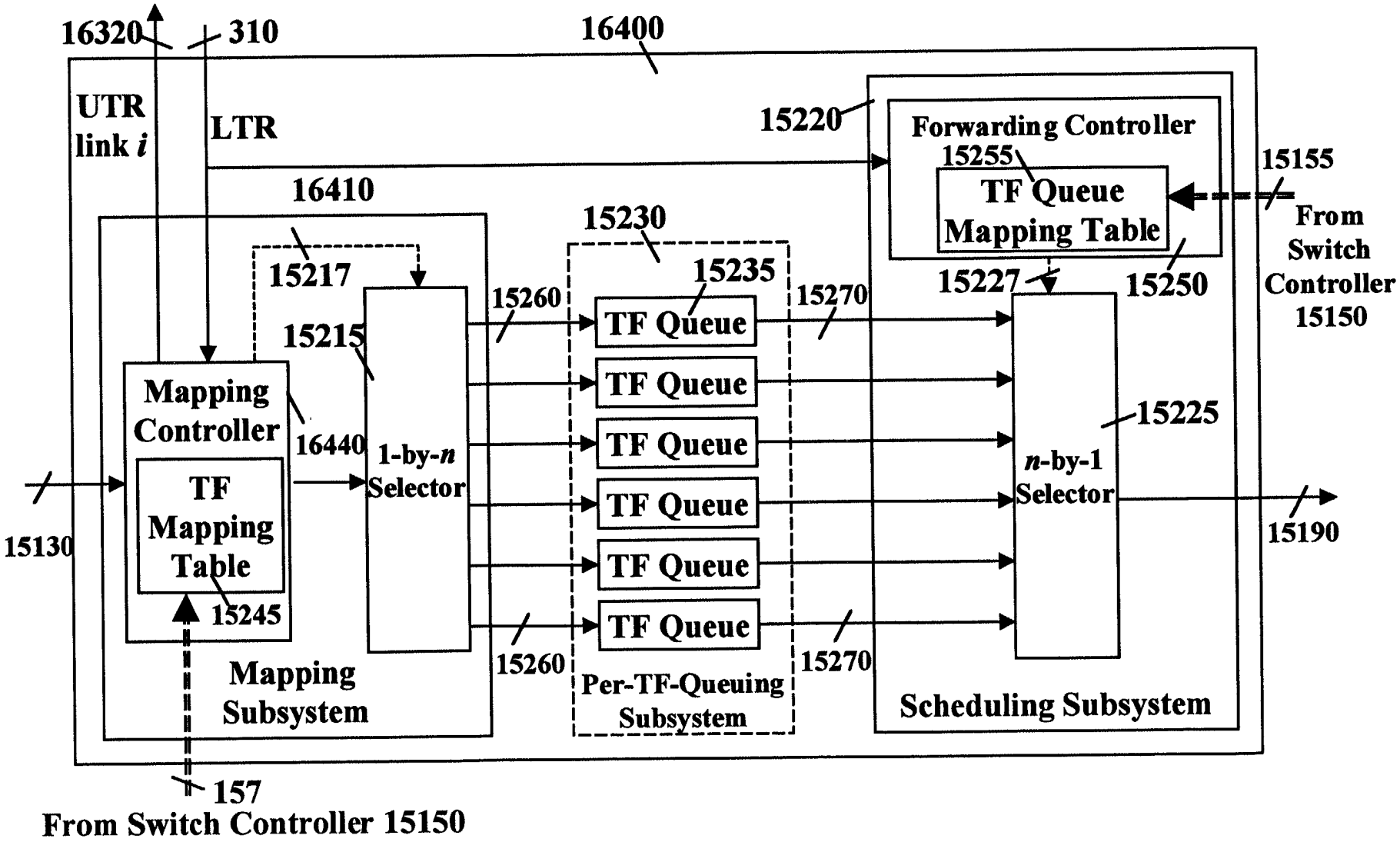


FIG. 31

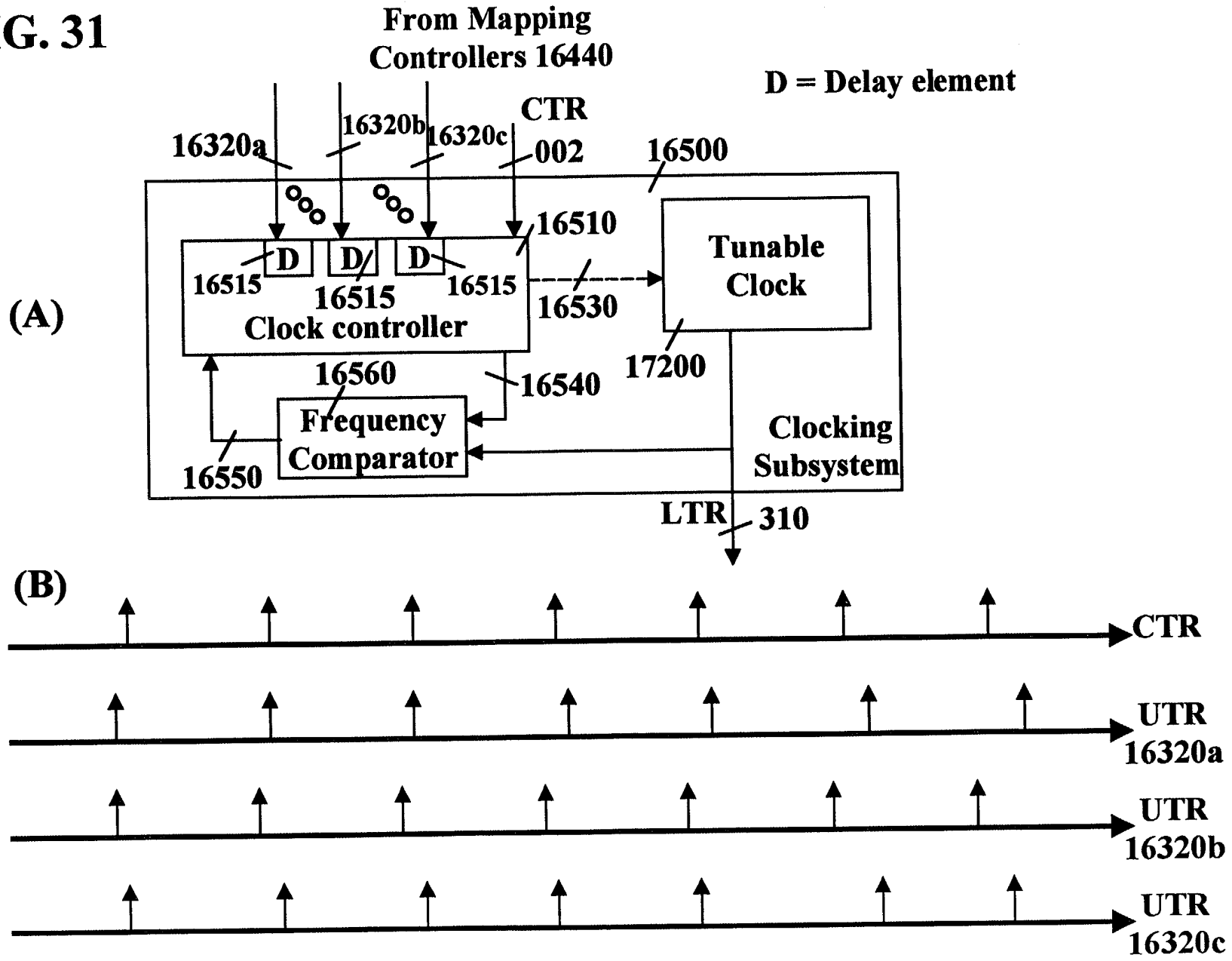


FIG. 32

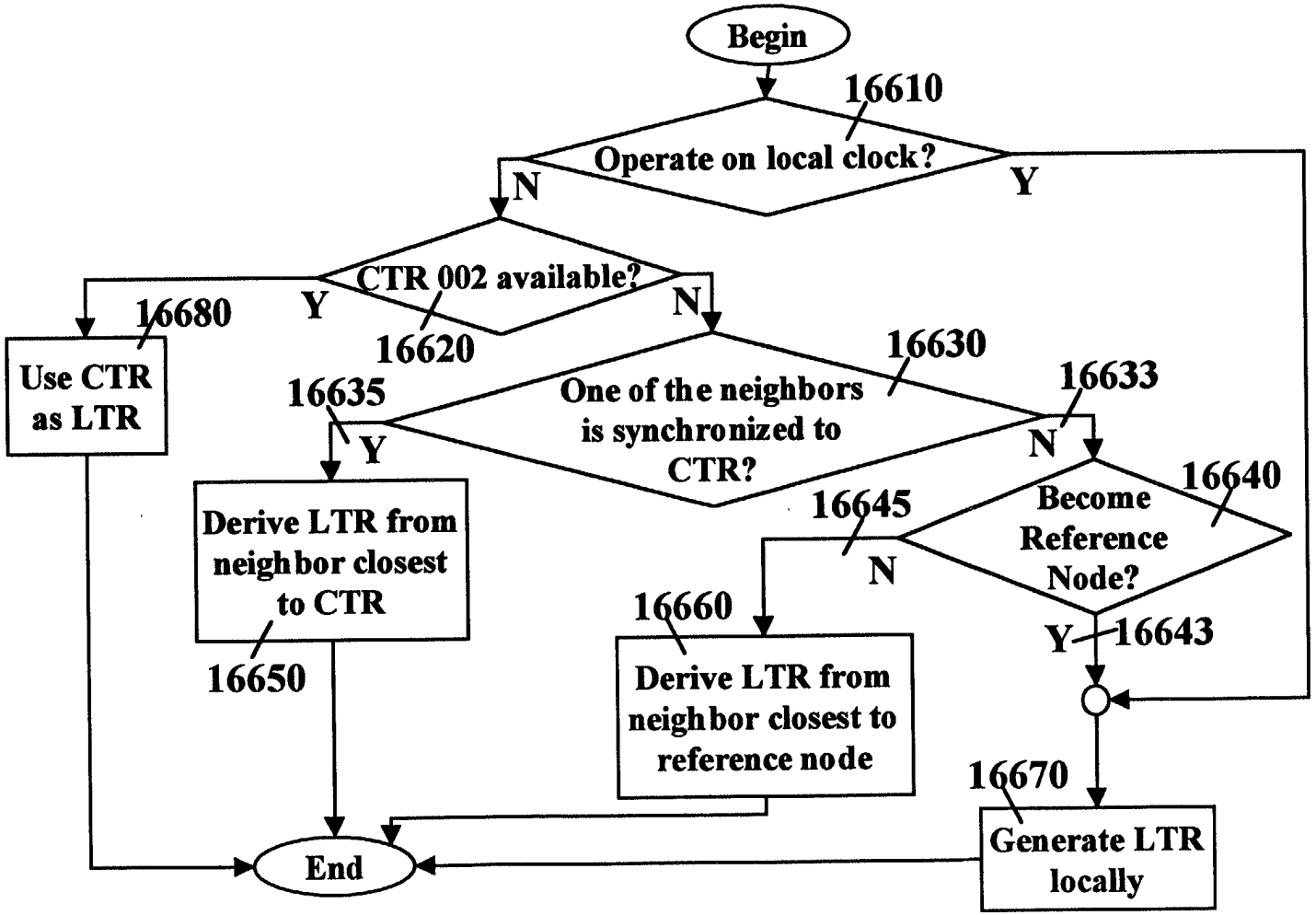


FIG. 33

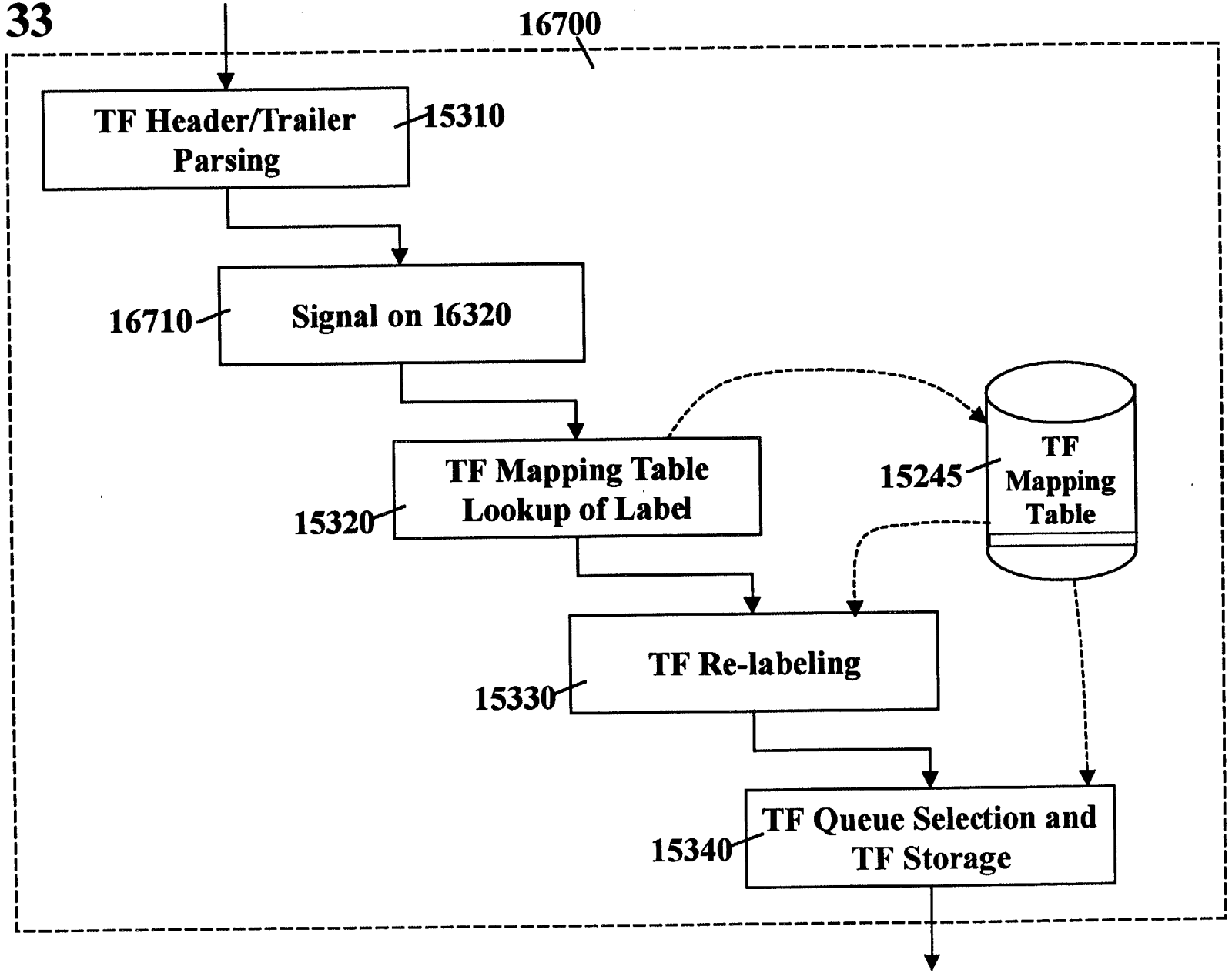


FIG. 34

TF duration [μs]	# TF queues	Memory req. [Kbytes]	Clock accuracy	Stratum	Tolerance D	H	M	S
7.8125	20	195	1.00E-10	1	7	16	27	42
7.8125	20	195	1.60E-08	2	0	1	9	10
7.8125	20	195	4.60E-06	3	0	0	0	14
7.8125	20	195	3.20E-05	4	0	0	0	2
7.8125	200	1,953	1.60E-08	2	0	13	21	35
7.8125	200	1,953	4.60E-06	3	0	0	2	47
7.8125	200	1,953	3.20E-05	4	0	0	0	24
7.8125	1000	9,766	1.60E-08	2	2	19	36	48
7.8125	1000	9,766	4.60E-06	3	0	0	14	6
7.8125	1000	9,766	3.20E-05	4	0	0	2	1
15.625	20	391	1.00E-10	1	15	8	55	25
15.625	20	391	1.60E-08	2	0	2	18	20
15.625	20	391	4.60E-06	3	0	0	0	28
15.625	20	391	3.20E-05	4	0	0	0	4
15.625	200	3,906	1.60E-08	2	1	2	43	11
15.625	200	3,906	4.60E-06	3	0	0	5	34
15.625	200	3,906	3.20E-05	4	0	0	0	48
15.625	1000	19,531	1.60E-08	2	5	15	13	36
15.625	1000	19,531	4.60E-06	3	0	0	28	13
15.625	1000	19,531	3.20E-05	4	0	0	4	3
31.25	20	195	1.00E-10	1	30	17	50	50
31.25	20	195	1.60E-08	2	0	4	36	41
31.25	20	195	4.60E-06	3	0	0	0	57
31.25	20	195	3.20E-05	4	0	0	0	8
31.25	200	1,953	1.60E-08	2	2	5	26	22
31.25	200	1,953	4.60E-06	3	0	0	11	9
31.25	200	1,953	3.20E-05	4	0	0	1	36
31.25	1000	9,766	1.60E-08	2	11	6	27	12
31.25	1000	9,766	4.60E-06	3	0	0	56	26
31.25	1000	9,766	3.20E-05	4	0	0	8	6

FIG. 35

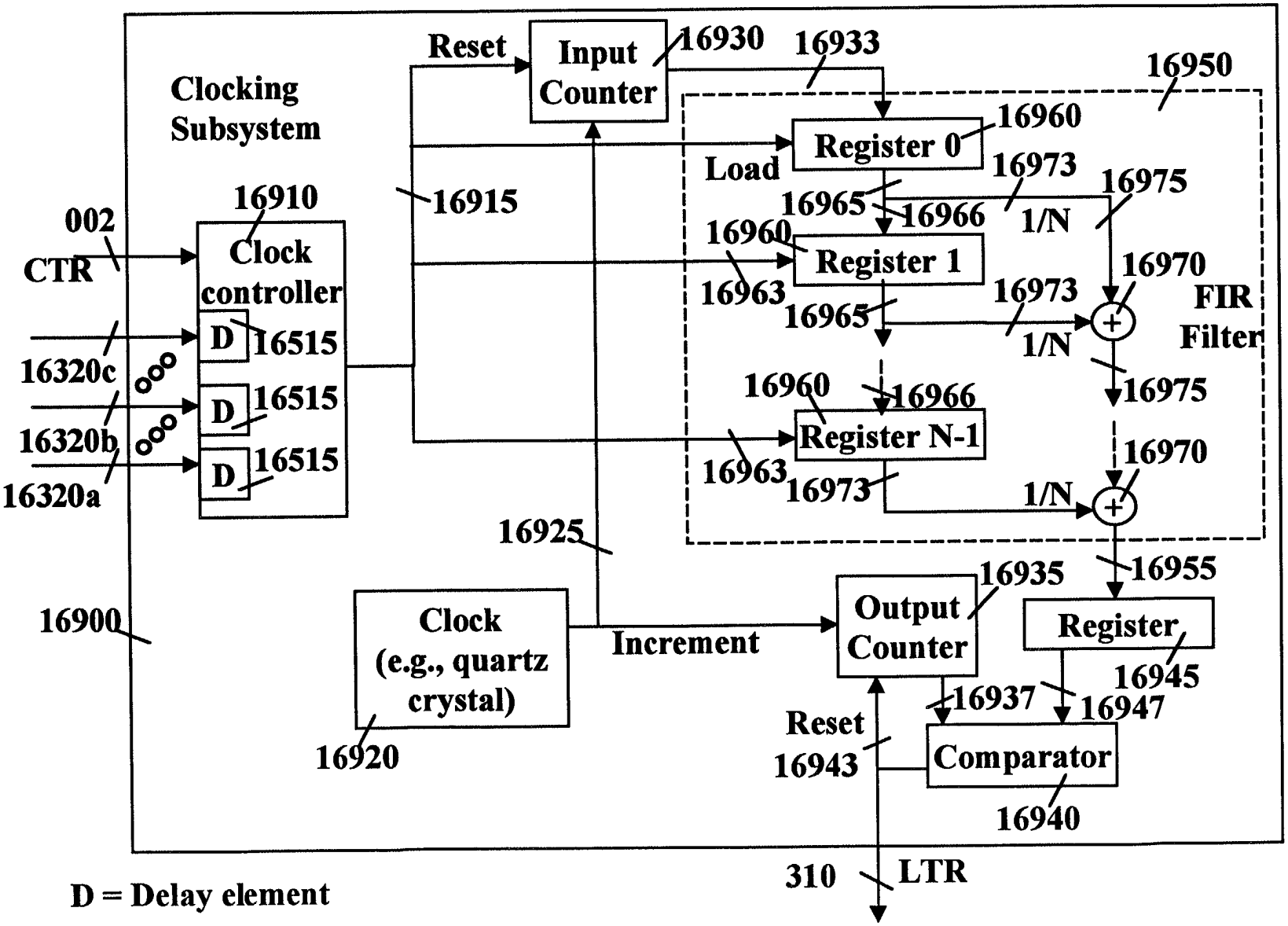


FIG. 36

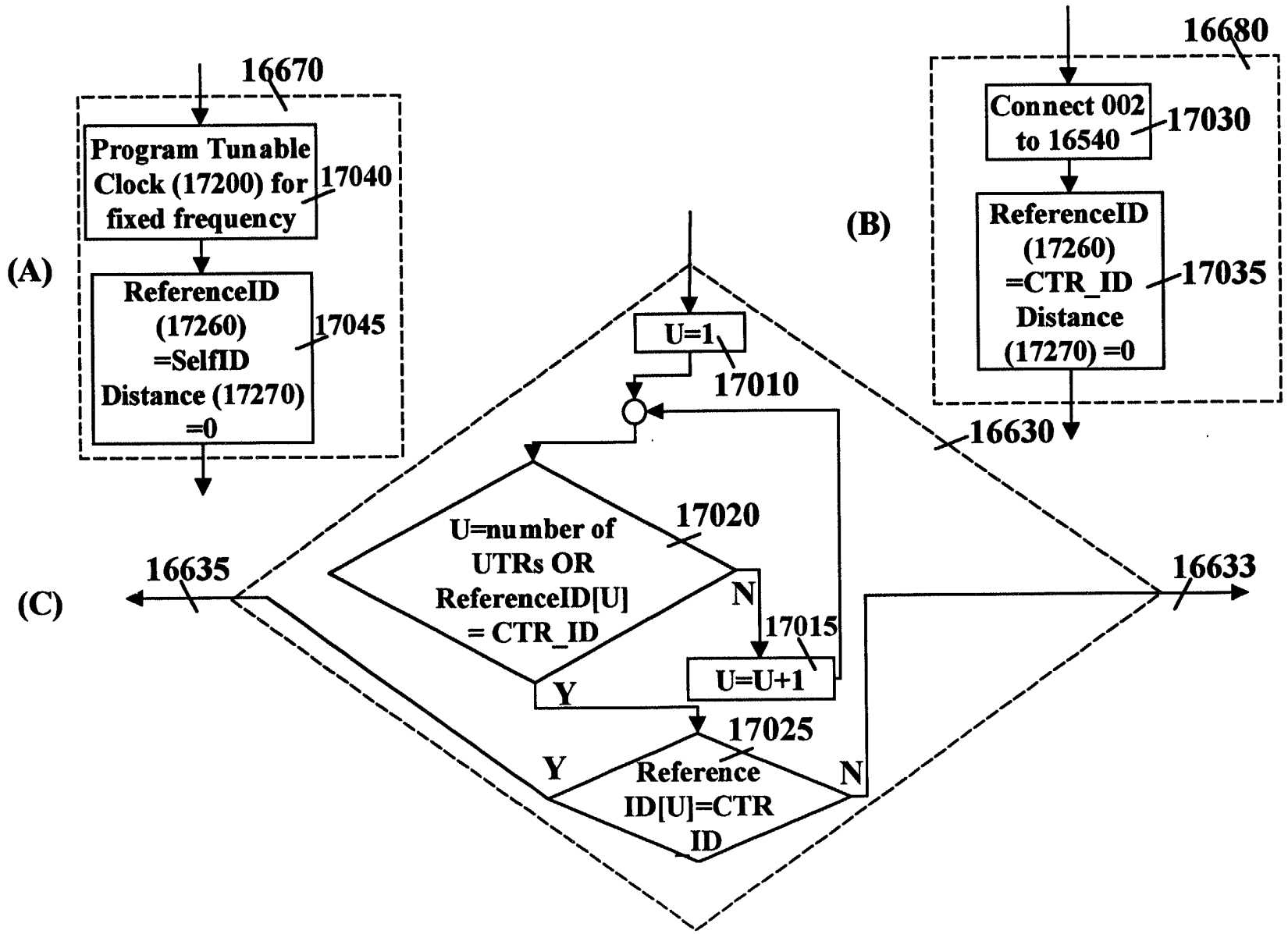


FIG. 37

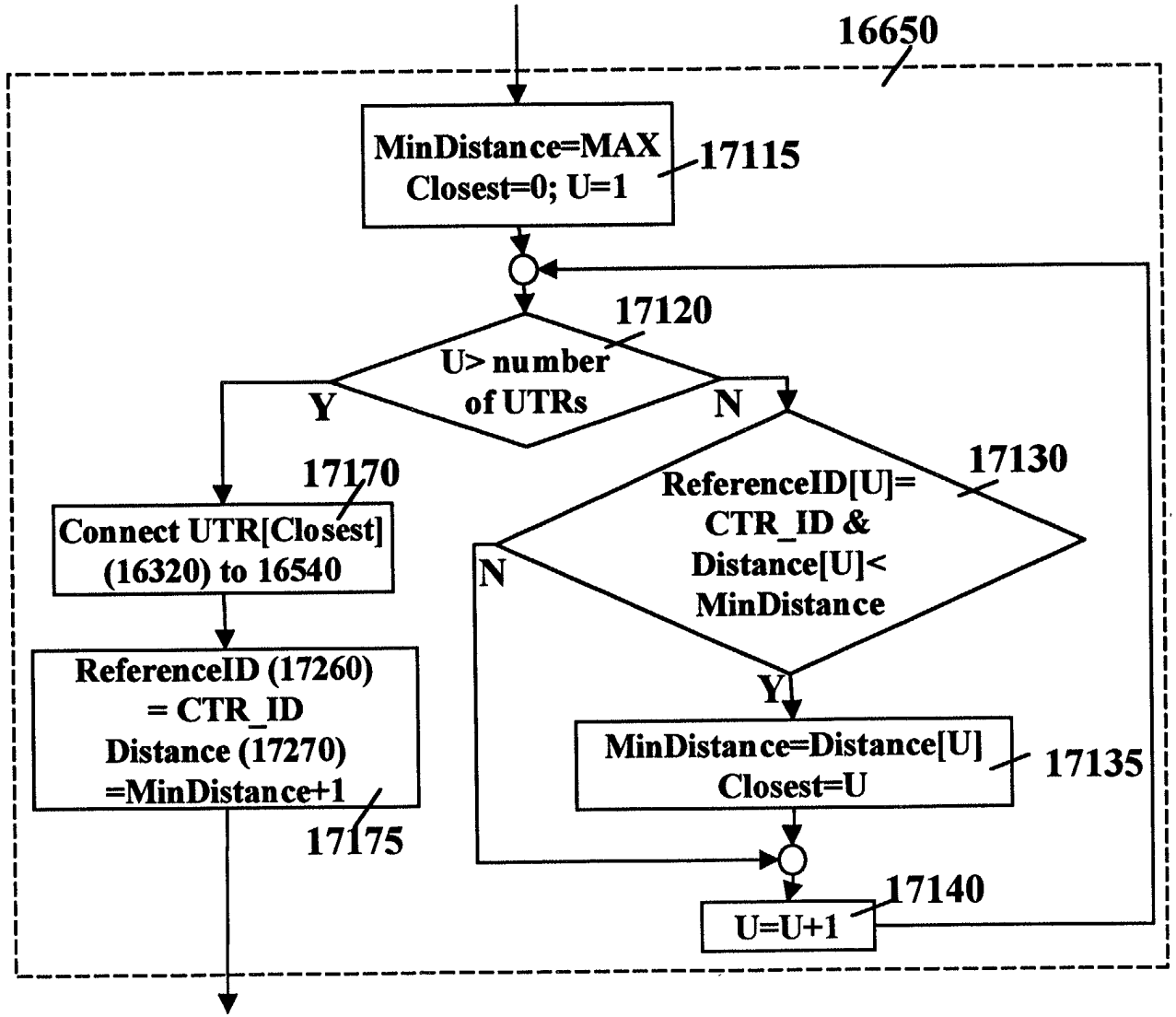
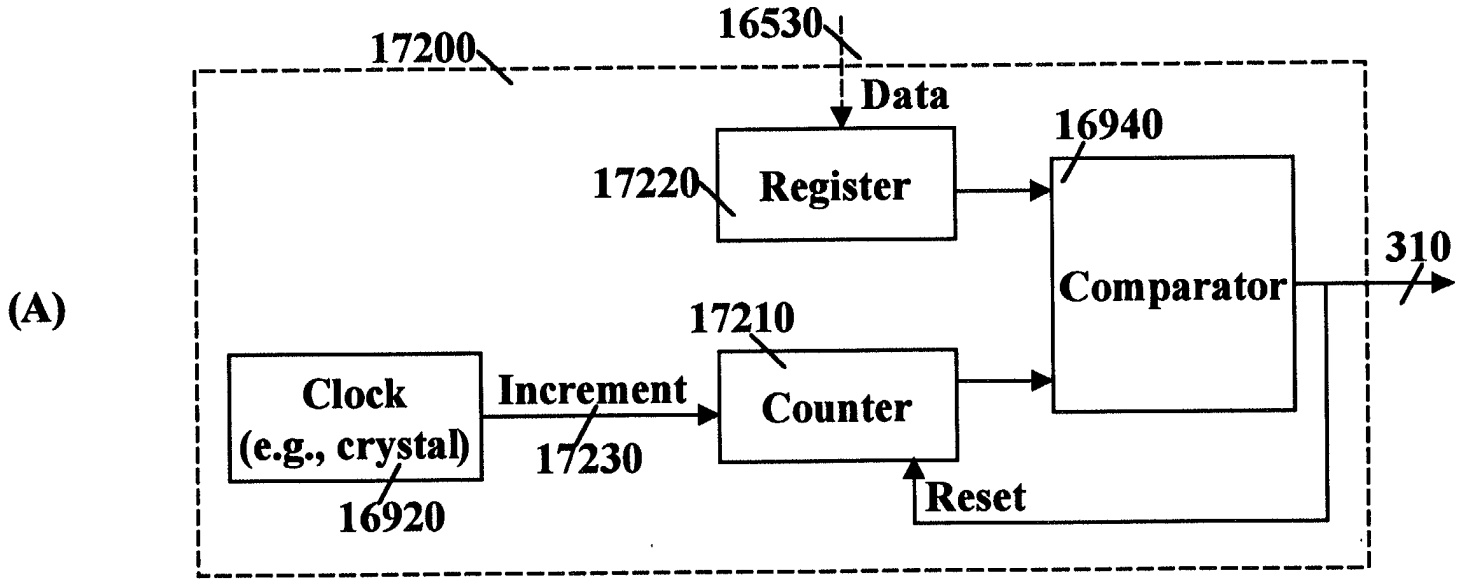


FIG. 38



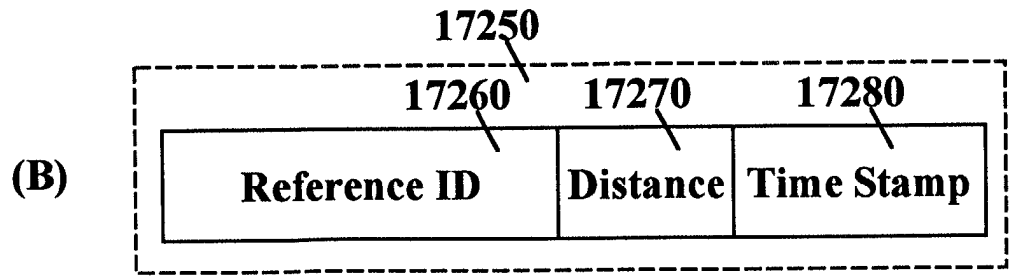


FIG. 39

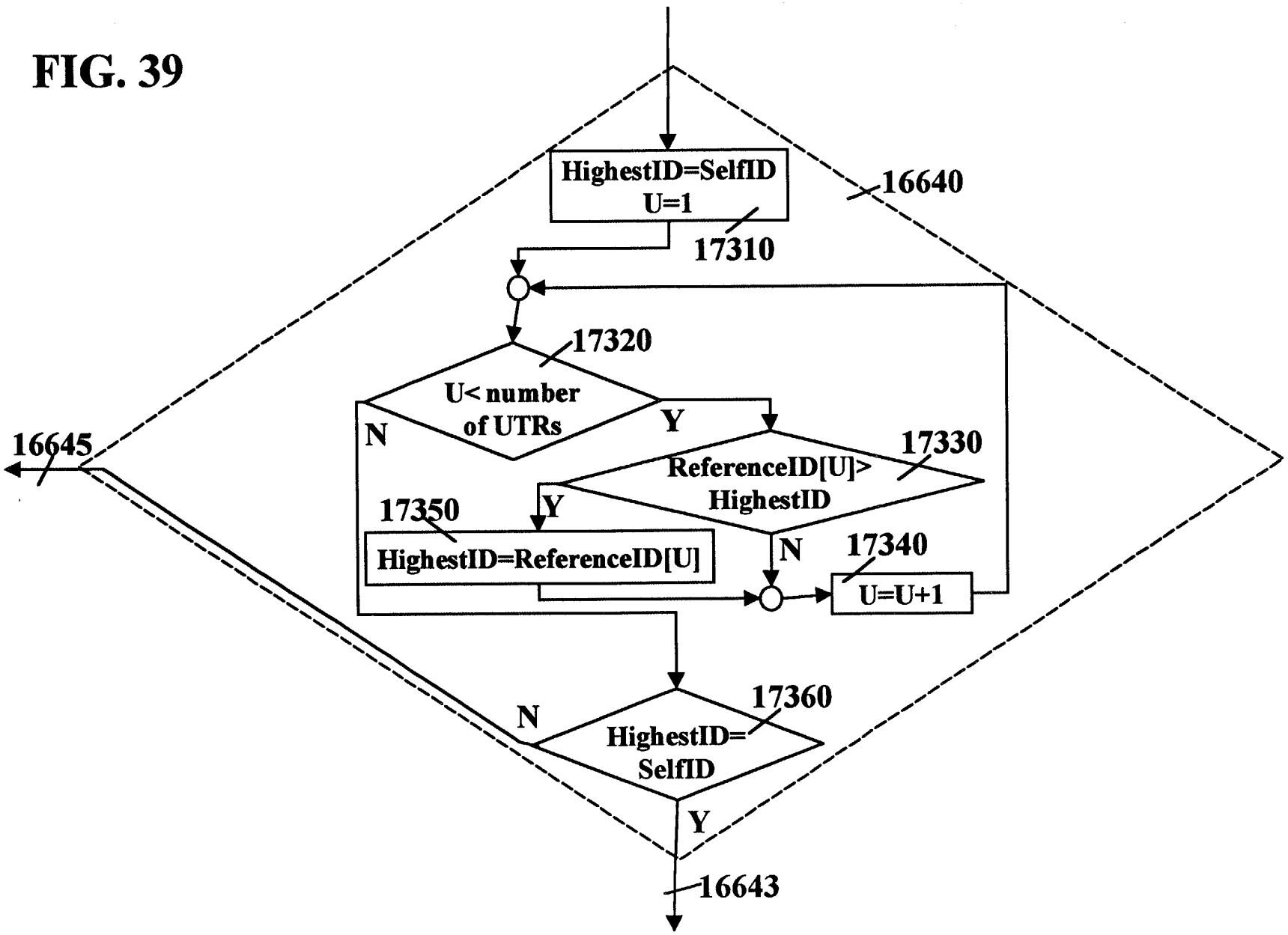


FIG. 40

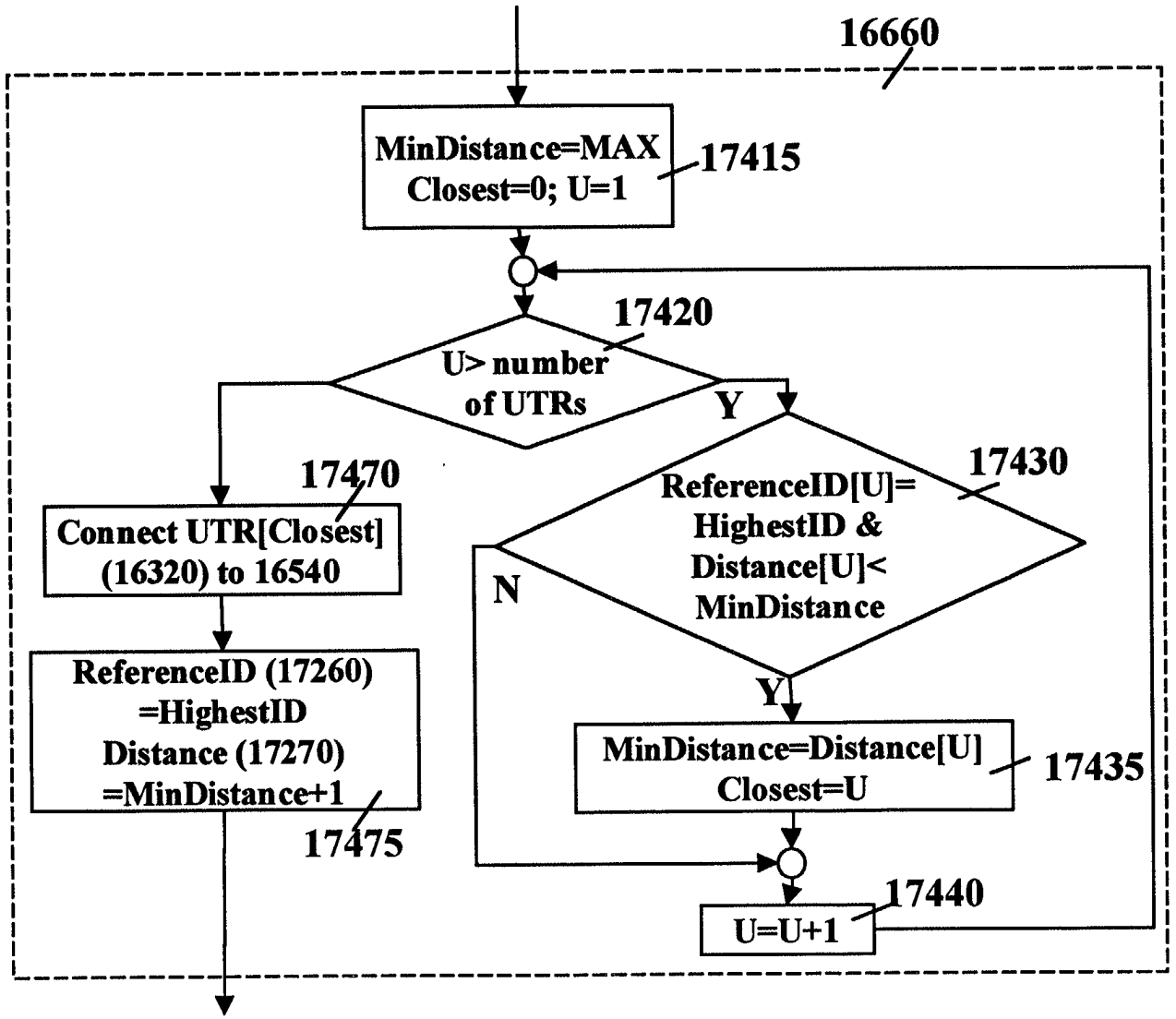
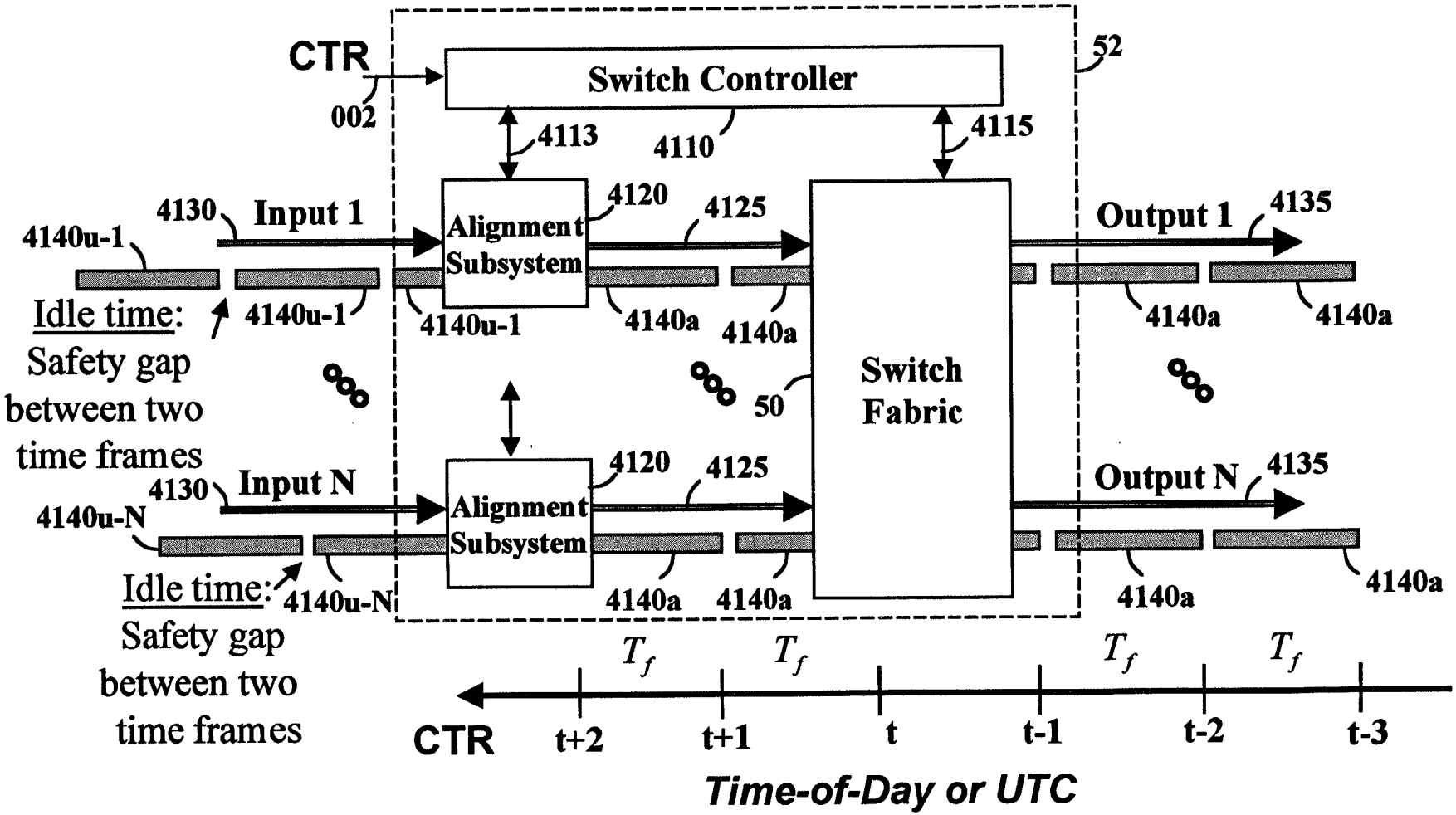


FIG. 41



4140 T_f : Time frame

: Time frame payload – with a predefined number of data units

FIG. 42

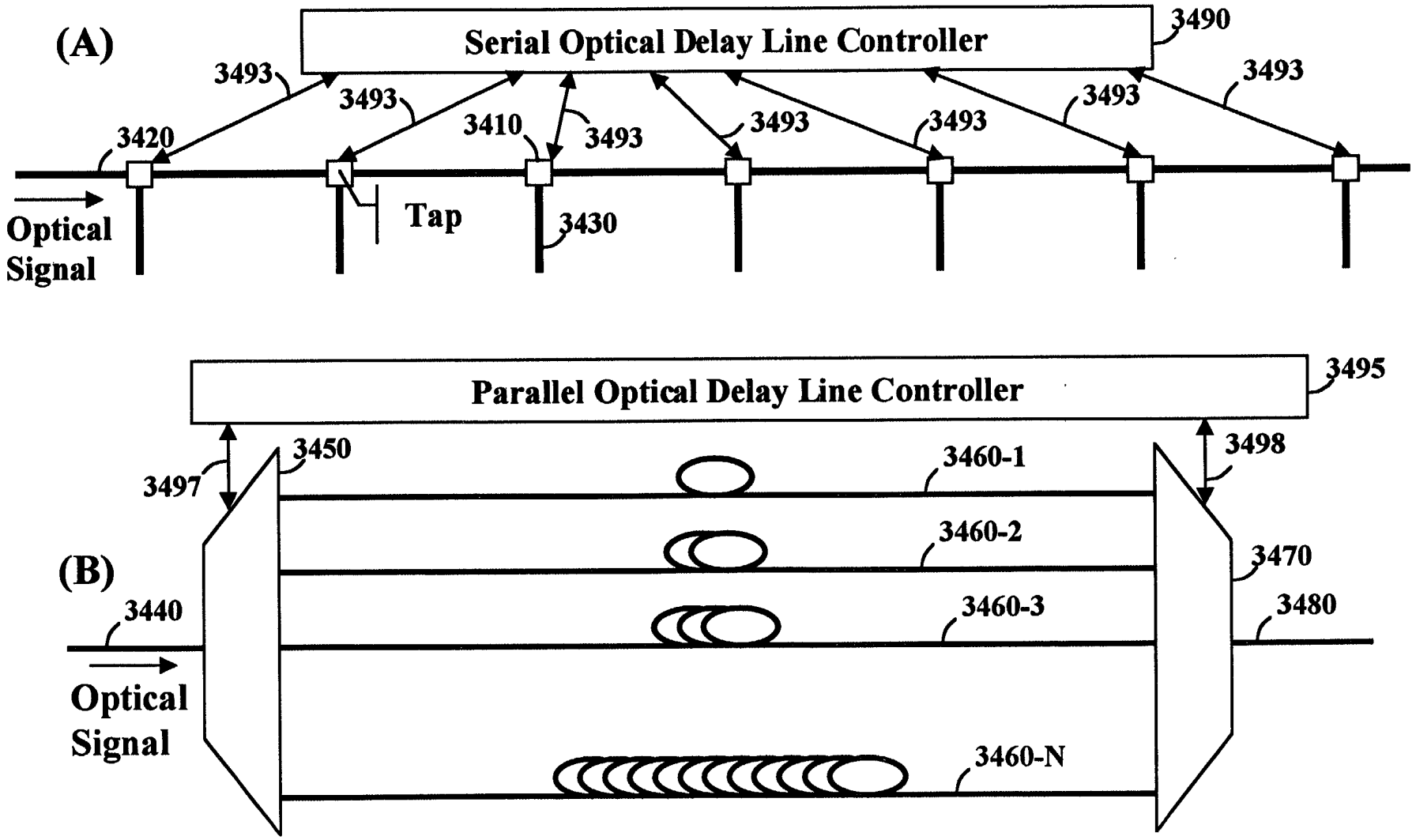


FIG. 43

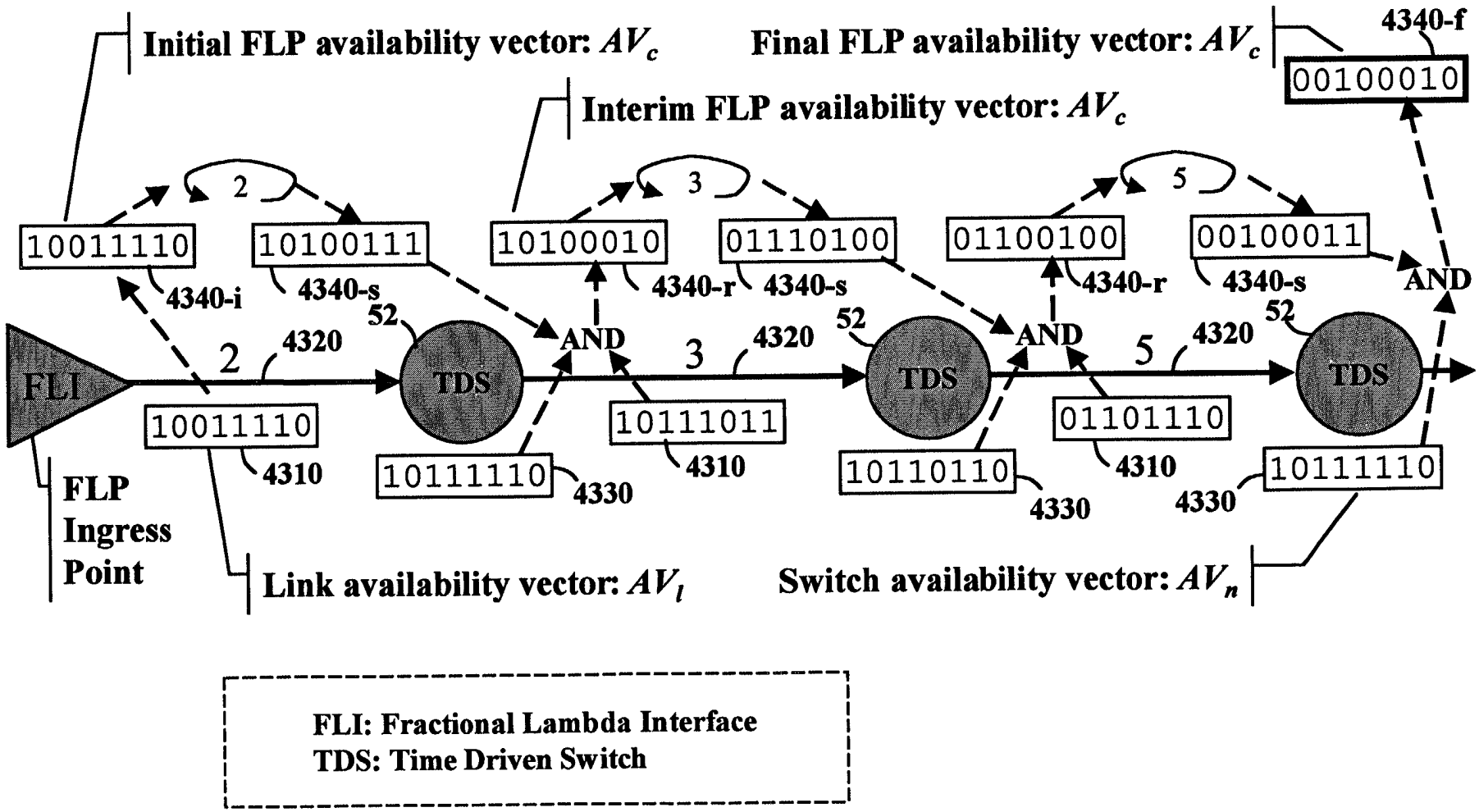


FIG. 44